AUG 7 1922

AUGUST

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

copy 10

1922

Causes of Systemic Infection—*Biddle*

Pulp Canal Filling—*Johnston*

Porcelain Restorations—*Vehe*

Public Service Relations of Dentistry —*Kirk*

Malocclusion as a Factor in Deformity —*Smith*

Conservatism in Bridge-Work—*Hart*

Management of Anesthetic Complications —*Thompson*

Treatment of Periodontal Lesions—*Towner*

A New Idea in Community Dental Service—*Editorial*

Change of Name—*Editorial*

PROPERTY OF
DENTAL LIBRARY
UNIVERSITY OF MICHIGAN
DON'T MUTILATE OR
REMOVE

TWENTY-FIVE CENTS

CONTENTS

The Dental Women's Club of Chicago ..... Frontispiece

ORIGINAL COMMUNICATIONS

Differential Diagnosis of Oral and Non-Oral Causes of Systemic Infection.
By J. F. Biddle, D.D.S., F.A.C.D. 641

Pulp Canal Filling and Ionization Results.
By Harry B. Johnston, D.D.S. 649

A Consideration of Factors Involved in Placing Porcelain Restorations Under the Gingivae.
By W. D. Vehe, D.D.S. 655

The Public Service Relations of Dentistry.
By Edward C. Kirk, D.D.S., Sc.D., LL.D. 662

The Doubtful Interrelationship Between Infected Teeth and General Disease.
By H. Schottmueller, M.D. 668

Malocclusion as a Factor in Deformity.
By Tom Smith, D.D.S. 672

Conservatism in Bridge-Work.
By Fred B. Hart, D.D.S. 682

Research Report for the Michigan State Dental Society.
By U. G. Rickert, M.S., D.D.S. 690

A Lecture Following Standardized Outline of the Oral Hygiene Committee of Greater New York.
By Arthur M. Hunter, D.D.S. 695

Physical Examination and Management of Anesthetic Complications.
By F. A. Thompson, M.D. 702

The Surgical Treatment of Periodontal Lesions.
By Justin D. Towner, D.D.S. 706

Education of the Public in Oral Prophylaxis.
By Frederick A. Bricker, D.D.S. 716

The Examination of Teeth in Group Medicine.
By Boyd S. Gardner, D.D.S. 720

Reminiscences of Forty-five Years in Dentistry.
By C. N. Johnson, M.A., L.D.S., D.D.S., M.D.S., F.A.C.D. 723

EDITORIAL DEPARTMENT

A New Idea in Community Dental Service 727

Index of Periodical Dental Literature 729

Change of Name 730

No, the Public is Not an Ass! 730

ANNOUNCEMENTS

Calendar of Meetings, (National, State).—New York State Dental Society.—Virginia State Dental Association.—Chicago Dental Society.—Northern Illinois Dental Society.—Susquehanna Dental Association of Pennsylvania.—Michigan State Dental Society.—Dental Corps Orders from War Department 731-732

ADVERTISING DEPARTMENT

Index to Guaranteed Advertisements A-65

Classified Section A-60, A-61

Anna Miller
Mary R. Mead
Jessie Miller Carroll
Florence Nasmyth
Winifred Conley
THE DENTAL WOMEN'S CLUB OF CHICAGO
Josephine D. Pfeifer President
Josephine E. Vander Wolf Secretary
Ida R. Buttner
Helen Sabuk

THE JOURNAL
OF THE
American Dental Association
VOL. 9 AUGUST, 1922 NO. 8

Original Communications

DIFFERENTIAL DIAGNOSIS OF ORAL AND NON-ORAL CAUSES OF SYSTEMIC INFECTION

By J. F. BIDDLE, D.D.S., F.A.C.D., Pittsburgh, Pennsylvania

(Read before the National Dental Association, Milwaukee, Wisconsin, August 15-19, 1921)

PROBABLY the most important problem before the dental profession today is such differential diagnosis as will enable an operator to determine when a tooth is a menace to health. The ultra conservative say: "A tooth should be retained provided its retention will enable a patient to masticate without discomfort." The extremist: "Extract every pulpless tooth, plus teeth with live pulps affected by pyorrhea alveolaris."

We are regaled with wonderful and so-called scientific theories to substantiate the claims of the latter operators, but in looking over dental literature to date, I fail to discover any definite scientific arguments that prove conclusively these theories. Therefore, we have deemed it expedient to adopt the following procedure in dealing with pulpless teeth:

Class 1. Patients in Good Physical Condition

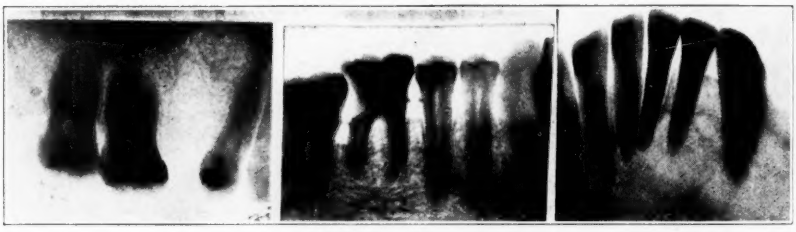
Radiograph the entire upper and lower arches where there be discolored teeth, large fillings and crowns; or where extensive restorations are required. If radiographs show the impossibility of opening canals of teeth, then extract. If canals can be opened and filled to apices, treatment is indicated; results to be verified at regular intervals by further radiographic examinations.

Class 2. Patients Suffering from Chronic Impairment of General Health

a. History of case; *b.* examination with explorer and mouth mirror; *c.* test teeth for live pulps; *d.* note condition of soft tissues; *e.* tentative diagnosis; *f.* full radiographic examination of arches; *g.*

thorough physical examination of patient; *h.* study of report of physical examination, radiographs, and further examination of the patient; *i.* extraction of all pulpless teeth; *j.* extraction or eradication of pockets of vital teeth affected by pyorrhea alveolaris.

The cases which concern us most and which require all the skill and knowledge at our command come under Class 2. Patients suffering with arthritis, infection of blood stream, heart, lungs, various parts of the alimentary tract, genito-urinary organs, etc., have had, in many cases, these conditions traced directly to the teeth, as the primary cause. Therefore we shall consider at some length the various steps in diagnosis of such cases, with examples of value in each case.



1 2 3

Figs. 1-3.—Fig. 1, clear socket; Fig. 2, hidden cavity under gum margin; Fig. 3, soreness of gum distal to lower right tooth.

a. The history of the case should be the first step, for frequently by this means some facts are brought out which aid materially in diagnosis. The Board of Medical Licensure of Pennsylvania deems case histories of so much importance that no hospital in the state can rank in Class A, regardless of other qualifications, if the staff fail to report a full written history on each chart. One of the qualifications for membership in the American College of Surgeons is that each applicant submit fifty complete histories of cases treated. The foregoing facts emphasize the value attached to case histories by the medical profession and in many instances they play an equally important part in determining correct diagnosis in dental cases.

One case is of a school girl, aged 17, with exposed pulp in upper left bicuspid. Treatment brought no relief, consequently tooth was extracted. As pain continued, the dentist treated socket in various ways, finally curetting and packing. Patient was finally referred to me for radiograph (Fig. 1), which showed socket clear and at least a quarter inch from the antrum. In taking a history of the case we found that the girl's mother had had maxillary sinus infection about five years previously. Upon further questioning patient it developed that she was positive sinus was infected on account of her mother's infection. Patient was highly nervous, in fact, inclined to be hysterical. Was underweight and anemic and was advised to see a physician for a thorough physical examination. Tubercular ovaries, tipped uterus and adhesions were discovered. The girl was operated on by a specialist who removed the ovaries, corrected other conditions, and who reported that had the condition continued another month she would undoubtedly have been beyond medical aid. Patient was operated upon five years ago and has completely regained her health.

b. Examination with explorer and mouth mirror frequently reveals hidden cavities and pyorrhea pockets.

The next patient, aged 52, had pains in head and jaws. As he could not

sleep, he consulted a dentist, but no cause was discovered for condition. He took considerable morphine and whiskey; when he became violent he was taken to hospital for observation. A subsequent examination of teeth revealed a hidden cavity (Fig. 2) under gum margin; radiograph further confirmed extent of cavity. After the tooth was extracted the patient recovered within a few days.

c. Test teeth for live pulps.—Thermal tests, tapping with instruments and high frequency current will often assist in determining the vitality of the pulp when the radiograph will not be of much assistance, since no apical involvement is apparent.

d. Note condition of the soft tissues. Are they of normal healthy color, or inflamed, spongy, and of purplish color? Do tissues fit closely to necks of teeth? Are any growths or spots discernible which might be indicative of secondary infection? Patient complained of soreness of the gum distal to the lower right cuspid tooth (Fig. 3), but the dentist paid no attention to symptoms until several months later, when patient's chin became quite painful and enlarged. The result was that he lost anterior part of mandible and eventually died as the glands of his neck and deep structures had become involved to such an extent that the use of the knife, radium or X-ray were of no avail.

e. Tentative diagnosis.—Tentative diagnosis should be made before radiographs are taken. Radiographs should be used as a means of corroboration of diagnosis rather than the first step in the process. Furthermore, dental radiographs should be taken by an operator who knows the anatomy of the mouth, one whose lifework fits him pre-eminently for this branch of our profession, the dentist.

f. Full radiographic examination of arches.—When such examination is indicated, radiographs of each tooth should be taken as well as all spaces from which teeth have been removed, for occasionally pieces of roots, impacted teeth, granulomas, etc., are found which may have remained in the mouth for many years.

We have on file many cases of faulty diagnosis from radiographs, taken by men who did not understand the different angles at which radiographs should be taken in various parts of the mouth.

Mr. B, a minister, aged 55, had a swelling and pain over right maxillary region, with discharge from the right nostril, a fulness of the right cheek, and a temperature of 101°. Transillumination, right antrum dark. According to the physician's X-ray report, the film of right upper molars (Fig. 4 A) showed these teeth negative. The antrum was opened thru the nose and treated for six months. The patient was referred for radiographic examination. All of the above-mentioned symptoms were still present, except the temperature, which was normal. Film of teeth (Fig. 4 B) showed both first and second molars abscessed and roots extending into the antrum. The teeth were removed and floor of antrum picked out with a pair of tissue forceps. The bone was almost black. The estimated flow of pus at this sitting was a tablespoonful. Patient made recovery in less than a month. Figure 5 shows structure removed.

For three and one-half years Mr. T., seventy years of age, suffered pains in his left shoulder and leg which had gradually been getting worse. He was short of breath and had periods of extreme weakness. Patient had traveled to many of the springs, sanitariums and hospitals in the United States. Was admitted to hospital and permitted to be up and about his room two hours daily. Examination revealed a blood stream infection which was so impairing the heart action that after two months' treatment hope was practically abandoned of his leaving the hospital alive. Patient's teeth had been radiographed on previous occasions during his round of travels and reported negative. Therefore his teeth were not radiographed in our institution until

practically every other source of infection had been tested with negative results. Examination showed fourteen teeth present in mouth and a partial upper plate supported by attachments to several teeth, one of which was a right upper second molar covered with a gold crown. All teeth were radiographed with negative results except the above-mentioned molar, which showed roots partially filled extending to the floor of the antrum. Tooth was removed and about 4 c.c. of a thick yellowish green pus was evacuated thru the nose by the insertion of the tip of an ordinary sterile water syringe into the tooth socket and forcing normal salt solution into the antrum. The odor was so offensive that it was

4

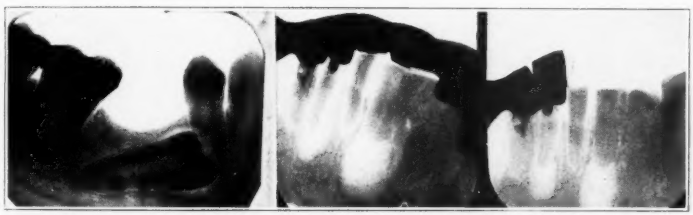
5

Figs. 4 and 5.—Fig. 4A, film of right upper molars negative; Fig. 4B showed both first and second molars abscessed and roots extending into antrum; Fig. 5 shows structure removed.

almost impossible to stay in the operating room. After this treatment the patient was taken to his room and during the next few days had several very serious relapses. He was kept in bed and the antrum irrigated daily. The quantity of the secretion gradually decreased and the odor became less offensive. Within a month he was discharged from the hospital with instructions to rest in bed at least half of each day for some time to come. He was so disgusted with teeth that he had some dentist extract the remaining teeth in his mouth, all of which had live pulps. It is four years since this trouble occurred, and the man is improved in health.

physician asked that teeth be extracted immediately. We refused to extract until after a thorough examination of patient and a report of general condition had been received. The patient died within twelve hours, and our refusal to extract probably saved us the odium of having caused his death. The Wassermann report, received after the patient died, was positive. Autopsy showed that practically every organ in the body was infected, yet there were absolutely no external signs of syphilis. Patient had been in good health until within six weeks of his death.

The above-mentioned case is cited to emphasize the value of thorough physical examination in patients below par and



6 7

Figs. 6 and 7.—Fig. 6, second bicuspid horizontally impacted with crown pressing on first bicuspid root and resorption of side of root to pulp; Fig. 7, large abscesses in various parts of the mouth.

g. Thorough physical examination of the patient.—In all cases of suspected secondary infection, the patient should be thoroughly examined by some expert medical diagnostician in whom he has every confidence before any extractions or treatment be undertaken (aside from temporary measures to relieve pain.) Such examination should include various organs of the body, as well as blood, urine and Wassermann tests. We have avoided several embarrassing situations in severe cases by adhering to this policy.

Mr. F., aged forty, was in the hospital two days. Temperature 102 4-5°; blood stream infection. Examination and radiographs revealed six badly abscessed teeth, four additional pulpless teeth and a bad case of pyorrhea alveolaris. The

the following case will further emphasize this fact, as a thorough physical examination saved this patient from a very serious and useless operation (Fig. 6).

Miss A., a school girl aged seventeen, had acute symptoms of mastoiditis several times during the year preceding our examination, which subsided after local treatment. Attending physician said that the next attack would require operation. Symptoms recurred within three months. The girl's mother insisted upon a thorough examination before giving her consent to an operation. In an examination of the mouth two teeth were missing on the lower left side. Patient said one tooth had been extracted, and further questioning developed that she occasionally had a burning sensation in this region with

slight soreness of first bicuspid during mastication. Radiograph (Fig. 6) revealed the second bicuspid horizontally impacted with crown pressing on first bicuspid root and resorption of side of root to pulp. Removal of these teeth resulted in severe symptoms of mastoiditis for three days, after which they gradually subsided. After three years, the patient has had no recurrence of the trouble. In this case the symptoms of mastoiditis were undoubtedly due to reflex pains from lower bicuspid region.

h. Study of report of physical examination, radiographs and further examination of patient.—If evident that all or some of patient's teeth should be extracted and there be nothing in patient's general condition to warrant delay we proceed at once. But if it be doubtful that teeth are causing trouble, and there are other factors, such as diseased tonsils, infection in genitourinary tract, etc., we refuse to extract until the other conditions have been cleared up. In the meantime, we try treatment.

i. Extraction of all pulpless teeth in advanced cases of systemic infection, as a patient's life is certainly of more value han the teeth. Better far to err on the side of extraction in such cases than to be held responsible for the loss of human life.

Mr. R., aged fifty-seven, for three years had been unable to comb his hair, dress himself, or to arise without assistance. He walked with the aid of a cane and crutch. Examination of the mouth showed a number of bridges which took the place of all masticating surfaces of original teeth. There was no discomfort of any kind associated with the teeth or jaws. Radiographs showed that no attempt had been made to fill the roots of pulpless teeth. There were a number of large abscesses in various parts of the mouth, two radiographs of which are shown (Fig. 7). The patient was subjected to a thorough physical examination with the result that his chart showed him to be physically perfect in every way. Removal of all his teeth was advised to which he finally consented after about ten days. Specimens from same revealed streptococcus viridans in practically all. The patient was sent to his home without any treatment or medicine of any kind and showed practically no improvement for two months. At the end of six months he was apparently normal and has had no recurrence of the trouble in more than five years.

j. Extraction or eradication of pockets of vital teeth affected by pyorrhea alveolaris. Mrs. C., aged forty-eight, physical examination negative. Sudden and great swellings appeared on the face and neck, particularly when she was excited or overworked. The swellings turned purple, in fact, to such an extent, that at times the patient was ashamed to let people see her. Took treatment from physicians for nearly two years, but without result. Radiographs revealed a number of pyorrhea pockets, some of which were removed by treatment, others by extraction. No return of the trouble within the past fifteen months.

In other cases we have removed all teeth and surgeons have removed nearly all organs of the body except the heart and lungs, and there has been no improvement in the condition of the patient, which simply proves as we already know, that a certain disease does not always have the same origin or manifestations in different people. Therefore, too much emphasis cannot be laid upon the careful study of individual cases, and the elimination of all other symptoms before resorting to wholesale extraction of teeth. Once convinced, however, that the teeth are or probably are the cause of impaired health, we should not falter in our duty, as human life is not a thing with which to trifle.

Every dentist should be in touch with some good pathological laboratory, either private or hospital, where he can send specimens and swabs from his cases for

examination and report. Many times by this means knowledge is gained which is of great value in treating a patient as well as of inestimable value in treatment and diagnosis of future cases.

The first essential of successful root canal technic is thorough sterilization of materials, instruments, trays, and dressings. Aseptic methods are just as essential for this work as in the surgical operating room, otherwise, our operation is a failure at the outset, and the patient would be rendered a greater service by the extraction of the tooth.

I shall not deal with the opening of the canals further than to say that good access must be established and the canal must be opened sufficiently to admit the gutta-percha point to apex, or here again we are doomed to failure.

The following materials and instruments should be used in filling root canals: Eucalyptol, chloropercha, gutta-percha points, cotton and paper points, smooth broaches, canal pluggers.

The entire operation is performed with the rubber dam in position. (1) The field is sterilized before removal of temporary filling. (2) The cavity is sterilized after the removal of the temporary filling. (3) The gutta-percha point is passed to the apex of the root and radiograph taken. If point extends beyond the apex, the excess is clipped off; if unable to attain apex, another point is inserted and a second radiograph taken. When point is found in correct position, it is removed and one of two methods is employed in filling root canal.

The first method is for small curved canals, in which we use single cone extending the entire length of the canal. The canal is flooded with eucalyptol, which is displaced with chloropercha worked gently to the apex of root with a smooth broach. All excess chloropercha is removed from the pulp chamber and the gutta-percha cone previously selected, and tested for correct position is forced to the apex of root. The larger portions of the canal are now filled with smaller cones, which if properly packed will leave a minimum of chloropercha remaining.

The second method is for filling large canals. Take cone which has been found to fit root canal and cut in small pieces, mounting apical end on root-canal plugger which will reach nearly to apex of root. Moisten the canal with eucalyptol and follow with a drop of chloropercha, placed near the apex of canal, then pass the point piece of gutta-percha to apex, and remove the plugger before taking radiograph. If point be found in position, it is followed by other small pieces of gutta-percha until canal is solidly filled. If the first piece of gutta-percha be not at the apex of the root, it is further packed with root-canal pluggers, and radiographs taken until its position be entirely satisfactory before attempting to fill the balance of canal.

I prefer the taking of radiographs with the actual point in canal, rather than with a diagnostic wire, as the wire may reach to the apex, whereas the point may not. However, if radiograph shows gutta-percha point has reached the apex the operator will undoubtedly be able to make the same point occupy the same position when the canal is moistened with eucalyptol and a small amount of chloropercha.

I am endeavoring to secure some absolute data regarding condition at the apex of a perfectly filled root canal which shows no indications of apical involvement, but this is very difficult since so many problems enter into the matter and besides there is only one way in which we believe this information may be secured, namely, the removal of the tooth after sterilization.

I have had three patients within the past three months who have insisted upon the removal of teeth which gave no clinical or radiographic evidence of infection. They regarded the teeth as a possible source of arthritis. These teeth were not removed to please patient or

physician, but in an endeavor to secure some evidence as to whether a pulpless tooth is always a menace to health, as some writers maintain.

Case 1: Patient aged forty-five: Tooth, upper left second bicuspid, root filled to apex, no indications of apical involvement, but root had been filled a number of years ago, before the profession had learned the necessity of thorough sterilization in all particulars. Laboratory report, streptococcus hemolyticus.

Case 2: Patient aged forty-eight. Tooth, upper lateral incisor filled to apex three years previously. Radiographed and clinical examination, negative. Tooth removed. Laboratory report, negative.

Case 3: Patient aged forty. Tooth, upper right central incisor. Root filled to apex and apical third removed. After two and a half years tooth was extracted and examination of socket showed a flat seat of bone which fitted perfectly over the stump of root. Laboratory test, negative.

Figure 8 shows a case operated upon five years ago. Both local and general conditions are excellent, and the radiograph confirms the examination.

In the interest of a more thorough knowledge of this subject and also for the benefit of the patients who do value the preservation of their teeth, I propose to eliminate all of these so called sources of focal infection that come directly under my observation, if patient continue to insist upon their removal after having been advised to the contrary. Until some such method of research has been carried out by a number of men interested in the subject and who are willing to experiment and record their findings, I believe we shall have no enlightenment upon this much discussed question. As a further suggestion, our schools could secure a number of patients, who do not value their teeth and who would be willing for a consideration to have a qualified member of the faculty fill roots of teeth and later remove the teeth in periods of from six months to three years. By this means definite knowledge would be gained of inestimable value to the profession which would result in the saving of many more teeth, or the health improvement of many patients by the removal of their pulpless teeth.

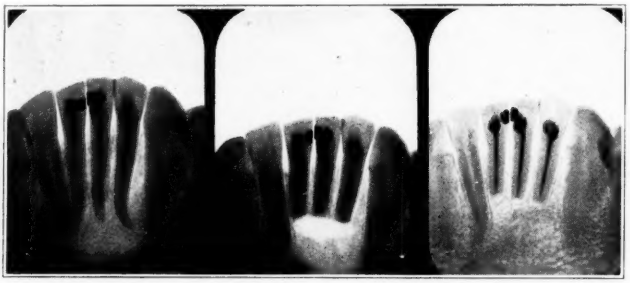


Fig. 8.—A case operated on five years ago. Local and general conditions excellent.

To recapitulate, my investigations to date point to the retention of pulpless teeth if roots be correctly filled to apices and there be no clinical or radiographic evidence of apical involvement, or serious systemic infection which cannot be accounted for after a rigid physical examination.

PULP CANAL FILLING AND IONIZATION RESULTS

By HARRY B. JOHNSTON, D.D.S., Atlanta, Georgia

(Read before District of Columbia Dental Society, January 24, 1922)

I AM thankful that in a paper of this kind it is no longer necessary to stress the importance of filling the main or trunk canal. It is still most important, however, to stress the importance of filling the accessory canals, for each of these smaller canals if unfilled constitutes as great a menace to the health of the tooth and the patient as the trunk canal.

It is a fact that the very great majority of tooth roots have more than one canal, and foramen, and it is my opinion that failure to fill these accessory canals and seal their foramina has been the main cause of failure with those teeth which the X-ray shows perfectly (?) filled. But, it is thought impossible to fill these with any degree of certainty, for it is not known where they are—the X-ray does not show them, and how can a canal be filled when its existence is uncertain? By the old chlorapercha method it is impossible, but I contend that it is not only possible, but easy to fill any number of accessory canals of any shape, size or direction, whether you know they are there or not. I will endeavor to prove this by X-rays of fillings made in the mouth.

Before going into this part of the paper, however, let us understand some of the principles upon which we cannot rely for accomplishing this purpose. The oldest method in which we have placed our faith and been totally disappointed is that involving force. It is a physical impossibility to fill these minute canaliculi by force without exerting such a great amount that it would split the tooth. This method also assures us of too great an excess of filling material beyond the foramen.

Dr. Callahan brought out his method which involves "persuasion." This is the most effective method evolved up to date for filling the trunk canal, but it is entirely futile for the accessory canals, except with certain modifications which will be outlined later.

A method of filling by capillary attraction was made known but by a long series of experiments I finally succeeded in proving that capillary attraction does not exist in the canal of a tooth in the mouth. The smallest ends of the capillaries are closed by the periapical tissues and it is a well-known fact that when the end of a capillary is sealed even by placing therein the most minute quantity of water, or other substance, the entire attractive force of the capillary is neutralized.

How may we render these minute canaliculi receptive to our filling materials? By man-made methods, or by utilizing the forces of nature? Man's chief function here on earth is to discover and utilize the laws created by God, whether pertaining to physical, mental or spiritual affairs. Nature has stored away in each pulp canal a force exactly sufficient to fill it perfectly, if we can perfectly utilize that force. This force is known as "The Law of Diffusion of Liquids"; which is in effect that two or more liquids capable of being mixed, will, when placed together, effect a spontaneous exchange of

molecules, even in defiance of the law of gravity, until each has become perfectly diffused throughout the other.

How may we best utilize this law in the filling of pulp canals? I do not know the best way—that is yet to be found, I think, but I do know one way which has in my hands given good results.

Briefly stated, the Callahan method consists of the use of dilute sulphuric acid as a decalcifying medium to assist in opening the canals, followed by a saturate solution of sodium bicarbonate, causing a rapid effervescence which effectively clears out all debris. The acid is also a powerful though superficial germicide. After dehydration, the canal is flooded with a solution of chloroform and water white resin in the proportion of twelve grains of resin to three fluid drams of chloroform. A point of pure base plate gutta-percha, only slightly smaller in diameter, but longer than the canal, is then selected, passed into the canal and caused to dissolve in the chloroform by a rapid though delicate pumping or stirring motion. We will now take up this technic at the first step after the tooth has been prepared for treatment, and to follow it through step by step in the proper sequence. The first and most important thing is to cleanse as thoroughly as possible the trunk and accessory canals of all organic material, and leave them clear so that they can be properly and perfectly filled in the last step of this technic.

Sulphuric Acid as a Cleansing Agent

For this purpose a 30 to 50 per cent aqueous solution of the chemically pure acid is used. It softens the wall of the canal by a process of decalcification so as to permit easy and fairly rapid enlargement of the caliber by curetting with various instruments. A valuable factor in the use of the acid is that it may safely be sealed in the canal, thereby giving it time to diffuse through accessory canals which cannot be reached with any instrument and can be treated *only* by grace of the law of diffusion of liquids. It must always be borne in mind that our only real problem is to fill these accessory canals and seal their foramina. By diffusion, the sulphuric will penetrate these more safely than any other chemical now at our disposal. It is far from being as effective in dissolving the organic content of these canaliculi as we would like, but so far the prime factor of safety to the patient has prevented the sealing in of any more effective solvent; for these canaliculi can be reached *only* by diffusion, which requires time. The organic matter in the canals and canaliculi is attacked to a marked degree, caused to yield up its water, shrink and release its hold upon the tube wall. The effervescence caused by the addition of the soda will then break it up and remove it cleanly from the larger canals and to a considerable extent from the smaller canaliculi. But although the organic matter is not perfectly removed from these, part of that remaining is forced out of the foramina into the tissues where it is promptly digested, and the remainder encapsulated in the filling.

The advantages of the dilute sulphuric acid then appear to be as follows: (1) it permits of the rapid and perfect cleaning and enlarging of the main canal; (2) its marked affinity for water causes its rapid diffusion through all the accessory canals where its well-known oxidizing properties have a burning or charring effect upon dead tissue; (3) the addition of soda produces such a violent effervescence that not only this debris but frequently even broken instrument points will be forced out by it; (4) it may be safely sealed in the difficult canal which will allow ample time for this diffusion through all canals and canaliculi, enlarging them by a self-limiting decalcification and cleaning and sterilizing by oxidation.

What about the possibility of pumping some of this sulphuric acid through the foramen? With reasonable care this result would be the very great exception;

any liquid placed in the empty main canal does not go ahead of the instrument, but follows it, and there is more danger of getting a laceration of the periapical tissue from the instrument point than an irritation from the acid. In a root having a large foramen there is only slight need for the acid, and it, like any other similar agent, must be cautiously and sparingly used in this type canal. It should not and need not be sealed in a canal of this kind.

Technic and Instrumentation

After the canal has been freed of pulp tissue, or old filling, the crown of the tooth is coated with cavity varnish, sandarac, or chloro-resin, the pulp chamber flooded with 30 to 50 per cent acid and the canal entered with a fine or extra fine Kerr pulp canal file. This is gently passed in until it hangs. It is then given about one-eighth twist, held in that position, and withdrawn. This is repeated; the acid is pumped in thoroughly until the instrument and acid have penetrated to about the apical third or has gone as far as it will easily go. The next smaller sized file is then used and the opening and pumping continued slightly farther. Measuring wires may be used at this point if desired. No instrument larger than the finest smooth broach or pathfinder should ever be passed through the foramen if it can be avoided. In the majority of cases it is easy to tell the foramen is about to be entered, as there is a slight constriction just short of the actual opening. The acid should be thoroughly pumped to this point and neither acid nor instrument carried any farther. It is difficult to coax the acid to this point and there is small danger of getting it any farther, except, of course, in the very large canals. The acid is neutralized at frequent intervals removing the debris, and just before sealing the cavity and dismissing the patient, fresh acid is pumped into the canal, the surplus absorbed out of the pulp chamber, a pellet of sterile cotton placed in, and the cavity sealed with *hot* temporary stopping without pressure. This may be left in for any length of time that may be desired or necessary, as the acid is self-limiting in its action, and, due to the alkalinity of the lime salts of the dentin, does not remain active for more than two or three hours.

If the canal is not perfectly straight and the Kerr file hangs at some point, or suddenly fails to penetrate farther, it should be removed from the canal, and with the radiograph as a guide, the point of the file should be slightly bent, reintroduced into the canal, and the opening into the remainder of the canal probed for. The very great majority of the canals can be freely and easily opened if the file is bent to approximate the curve of the canal. Force plays no part in the opening of a pulp canal—it must be done by "persuasion."

Let us study for a few moments just what the acid does while it is in the canal and how it does it. In a pulpless tooth all of the canals and canaliculi are as a rule filled with decomposed organic matter in aqueous solution. That can be removed from the main canal by absorption, but it cannot be so removed from the fine accessory canals. When the main canal is flooded with the acid then the law of the diffusion of liquids comes to our help, and as the 50 per cent of water contained in the acid solution is not sufficient to satisfy the acid, it takes up more water from whatever source it can gather it. Sealed in the tooth, its only available supply is contained in the accessory canals and to some extent in the tubuli. It can gather but little from the tubuli, however, because of the wall of calcium sulphate which it quickly builds up around itself and which prevents its further penetration. It must therefore act upon the watery content of the accessory canals, which it promptly does. The water in these canals is drawn into the acid and the acid flows back into the canals. In other words, sufficient of the

water and the acid change places to produce a balancing of the solution. Does any of this acid diffuse into the tissues beyond the foramen? Not unless the apical tissue has been broken down and replaced with cystic fluid. Its action in coagulating albumen will not permit it to actually enter living tissue. There again it is self-limiting.

It must have a fluid medium and finding such in the accessory canals, it follows them to the ends, oxidizes and breaks up the dead tissues contained in them, and destroys the bacteria. In treating the canal it is not possible to ascertain where these accessory canals are, their number or direction; but if they are present, the acid will find them.

Subsequent application of fresh acid followed by the soda will result in the complete removal of all organic material from all of these canals excepting those exceedingly small and quite longer than the average.

Filling the Canaliculi by Diffusion

When we have finished with our acid and neutralized it for the last time, our canaliculi are filled with water, holding many chemical compounds in solution. The water effectively bars the entrance of chloro-resin solution, so that something else must be substituted for this water, something which has an affinity for chloroform. Alcohol is ideal for this purpose. Then main canal is flooded with 95 per cent alcohol, which is thoroughly pumped and churned into it. By diffusion this is substituted for the water in the canaliculi, which is filled with a lower grade alcohol. Ample time must be allowed for this, for if the canaliculi contain less than 85 per cent alcohol, the chloro-resin will not diffuse through them. This usually requires from one to three minutes. All of the alcohol which can be removed with absorbent points is then taken out and the pulp chamber and canal flooded with the chloro-resin. No pulp canal driers or hot air must be used at this stage, for we wish the canaliculi to *remain filled with alcohol.* The chloroform diffuses perfectly and rapidly into the alcohol, and inasmuch as the resin is in perfect solution in the chloroform, wherever the chloroform goes the resin goes. Time is required here also. Two to three minutes are needed to pump in fresh chloro-resin as the chloroform is soaked up by the tubuli and canaliculi or passes off by evaporation. Toward the end of this period, when the solution in the canal begins to get rather heavy, pure chloroform is added as needed to keep it sufficiently thin to dissolve the gutta-percha point.

When this third substitution or diffusion is complete, a gutta-percha point of suitable size and shape is then passed into the canal and is dissolved by either a pumping or stirring movement, which movement is governed by the size of the foramen. With a normal, small foramen, a very gentle pumping is best; with a large foramen this might force too much chloro-percha through; therefore a stirring movement is used.

We are told, and correctly I think, that chlora-percha in hardening shrinks from the periphery. In other words, it releases the walls of its container. And we are also told that chloro-resin-percha in hardening shrinks from the center and clings to the wall of its container by virtue of the strong adhesion of the resin and the fact that tiny threads of this material actually enter the tubuli. An excellent way to assist this central shrinkage and peripheral adhesion is as follows: After the filling has been sufficiently condensed with the canal pluggers, a plugger of suitable size should be selected and by passing it down through the center of the filling for at least half the length of the canal all central cohesion is entirely broken up.

The pulp chamber should then be quickly filled with cement so as to prevent external exaporation of the chloroform, for if the chloroform is permitted

to evaporate externally, even the foregoing precaution will not prevent peripheral shrinkage.

Nothing has been said so far about the effectiveness of the resin in filling the tubuli. Chloroform is one of the most penetrating liquids and it not only quickly penetrates the tubuli, but the interprismatic spaces between the enamel rods as well. This can be easily proved by dehydrating an extracted tooth, allowing it to dry out or by a protracted immersion in alcohol or acetone soaking it for several hours in heavy chloro-resin solution. An attempt should then be made to break the enamel with a chisel or by grinding with a coarse stone. An old tooth which has been dried out for years and the enamel of which is as brittle as glass can be made as tough as a fresh tooth in a very few hours by this simple process. This is an excellent way to treat teeth so as to prevent the chipping off of the enamel while preparing them for various uses and also to prevent their cracking and checking in after years.

If this solution will carry sufficient resin into the interprismatic spaces to have this effect on old, dried-out teeth, there can be no argument about its carrying sufficient resin into the infinitely larger tubuli to effectually obliterate them and encapsulate in its dense, solid substance any bacteria they contain. Even though the resin is not a germicide or antiseptic, a bacterium encapsulated in it is entirely harmless.

Destruction of Apical Infection

For the past six years it has been our practice to ionize each infected or suspected tooth before filling the pulp canal, and even with the old solutions used for this purpose we obtain some really remarkable results. For the past two years, however, we have been using a solution of iodine for this purpose which has given results so marvelous as to have been entirely beyond any expectation. This solution is simply the old time Churchill's tincture of iodine. With this it has been possible to accomplish the destruction of infection to an extent we had not even dared hope for. This result is due to the very high iodin content of this solution and the fact that it is intensely electro-active. It contains 16½ per cent free iodin and 2½ per cent combined, giving an electro-chemic strength of 19 per cent.

Iodin is the most intensely electro-active of all of the elements commonly used for ionization. According to the report of the Bureau of Standards, it is 3 8/10 times as active as its nearest competitor, zinc; that is 3 8/10 times as much iodin will be conveyed in a given length of time by a given strength of current than of zinc. Sodium has a relatively low electro-chemical activity.

We have been able to prove by experiment that the iodin contained in this very heavy solution will be entirely driven out of fifteen drops of the solution by a current of one-half of one milliampere continued for thirty minutes. That great a quantity of iodin would be ample to completely sterilize quite a large area of either soft or osseous tissue.

Clinically, the results of this method of ionization have been astonishing. I will briefly outline these general results, and then give a few case histories. We have used it in all types of cases, and our results have been uniform, except in those cases where the apex of the tooth has been damaged, and by damage we do not mean simply denuded but actual resorption. In over two hundred cases, of which we now have record (this refers to pus cases where there was drainage either through the tooth root or on the buccal or lingual tissues), in only five cases have we been unable to entirely stop the flow of pus by thirty minutes' ionization, and have complete *exclosure* of the sinus within twenty-four to forty-eight hours. The majority of them closed within twenty-four hours, leaving only a white spot of scar tissue. That, of course, refers to the sinus on the gums. Where the sinus was

through the tooth, that was closed immediately by the filling of the roots, which we always do immediately after ionization.

CASE 1.—Girl, aged thirteen. Lower right first molar; abundant flow of pus from both roots, persisting for over three months in spite of treatment by several good dentists. Could not be sealed for more than an hour. Three ionizations with zinc chlorid gave no results.

TREATMENT.—Pus removed with peroxide, Churchill's tincture of iodin pumped into the canals: zinc point placed in each canal and all three of them ionized simultaneously. Current on for fifteen minutes, giving one-half of one milliampere per canal; or a total of one and one-half milliamperes. The canals were then filled immediately. The following day when the patient returned, she reported that there had been absolutely no pain, and the tooth perfectly comfortable at all times, and capable of mastication.

CASE 2.—Boy, aged fifteen. History showed an acute abscess four months previously on lower left first molar. No treatment given at that time. Copious flow of thin, light pus.

Treatment and result identical with Case 1.

CASE 14 (Cited because it is the worst case of its type I have ever treated.)—Woman, aged about twenty-five. Upper right bicuspid: very ugly sinus of five months standing on the buccal gum. Treatment same as the other two cases quoted; except as this tooth had only two canals, it was given a total of only one milliampere. Twenty-four hours later, the sinus was entirely closed with only a white cycatrix remaining. No after pain or soreness.

CASE 39.—Boy, aged eighteen. Upper right first molar; condition exceptionally foul; small quantity of heavy vicid pus. Treatment the same as previous cases. Patient returned afternoon of the same day suffering acutely. Tooth was extracted and in the mesial socket was found a large opening in the antral floor. (Radiograph is often deceptive in regard to this.)

CASE 41.—Lower right bicuspid; putrescent; treatment as above; entire relief of pain and no after soreness whatever.

CASE 106.—Young woman, aged about twenty-two. Upper right first bicuspid showing all symptoms of periapical abscess in acute stage. Tooth extremely sensitive to percussion; some swelling of the cheek; patient entirely unable to sleep the previous night.

TREATMENT.—Pulp chamber entered; putrescent material removed with peroxid; canals cleansed and smoothed with sulphuric acid and files. This neutralized, dried out with absorbent point, Churchill's tincture pumped in, and both canals ionized for thirty minutes, renewing the solution twice. Canals were then filled, tooth radiographed and patient dismissed.

RESULT.—By the late afternoon all pain had disappeared and the soreness materially reduced; and at examination, all swelling had disappeared.

Cases 114 and 143 were practically identical, and the results the same.

We have recently attempted some very extensive experiments testing the depth of the sterilizing effect of ionization and have had some rather remarkable results. In addition to ionizing extracted teeth which had come out with the granuloma intact and producing absolute sterility of both tooth and granuloma by thirty minutes' treatment, we have ionized cultures of bacteria in agar and have succeeded in sterilizing or producing practical sterility of as large an area as 40 c.c. This particular instance was an experiment with colon bacilli and staphylococci. The same result was obtained with pure cultures of staphylococci, and streptococci though we have not found a way to show it photographically.

A CONSIDERATION OF FACTORS INVOLVED IN PLACING PORCELAIN RESTORATIONS UNDER THE GINGIVAE

By W. D. VEHE, D.D.S., Minneapolis, Minnesota

(Read before the National Dental Association, Milwaukee, Wisconsin, August 15-19, 1921)

IN THE placement of our porcelain restorations under the gingivae there has always been a division of opinion in the matter of the gingival enamel. This controversy seems to have centered around the proposition as to whether all of the enamel should be removed in the procedure of a proper preparation or whether it is safe and expedient to place our margin in this enamel. If the latter procedure seemed to be the desirable one then the manner of finishing this margin was the matter of concern. This is especially true where our restorations assume the proportions of a crown.

The technic of the crown and bridge-worker as it is today has been an evolutionary development, that is clinical experience has convinced him of the desirability of maintaining this enamel intact and to avoid any irritation to the tissues at any time. The porcelain workers are very much divided on this point, in fact, they are at opposite ends, so to speak. In the serious consideration of the reasons that are given for the procedure in the one way of eliminating this last portion of enamel, or the other, of avoiding this radical procedure, so called, these reasons are at best but mere opinion and not at all conclusive; in fact, they are not based on the consideration of the embryology, histology, and the anatomy of the parts involved, except in part only. When we stop to consider how vulnerable this area really is and that most of the diseases of the surrounding soft tissues have their inception here, one must become impressed with the wonder that there is this division of opinion still existing. The profession is entirely agreed on the importance of preserving and maintaining the function and health of this tissue. It is also agreed on the weakness of the enamel when it is not protected or supported, but further than this, the true condition that confronts them is not recognized or perhaps understood.

It seems to have been the contention of some workers, who still believe in the entire removal of the enamel from the tooth, that such an operation is entirely possible in all cases without injury to the soft tissues.

It is not my intention to formulate a definite procedure and to mold all opinions into this one. Our most capable men have not been able to do that and besides it would be hopeless to expect that all should be agreed. On the other hand it is the purpose of this paper to study the soft as well as the hard tissues of this area, namely the gingivae, from the standpoint of embryology, histology, and anatomy. It is hoped that in such a study we will come closer to a standardization of our procedure based on a full

understanding of the requirements of the structures involved.

In the consideration of the embryology of the tooth it will be recalled that at about the second month of embryonal development we are able to see the beginning of the dental ridge on the crest of both the upper and lower arches. This ridge is the beginning of the formation of both the temporary and permanent teeth. The development of the tooth band follows quickly and then in turn the lamina, from which spring the twenty germs from which the temporary teeth are developed. The development of these germs is well under way and the epithelial cord, which connects the tooth germ with the ridge, is about to be ruptured when the permanent tooth germ is sprouted and grows down into the mesoderm to a point below and to the lingual of the developing temporary tooth. This epithelial cord is of epiblastic origin and forms the enamel organ. As this bud or cord continues to grow into the mesoderm, this latter tissue condenses to be formed into the dental papilla. The enamel organ, due to the more rapid growth of the outside cells and the resistance of the mesodermic tissue, is converted into a cup-shaped structure. The inside of this structure is filled with this mesodermic tissue and is the beginning of the dental papilla. The development of these two structures, which constitute the tooth germ, continues until the dental papilla assumes the form of a typical tooth crown. At the same time there springs from the base of the papilla fibrous tissue which grows upward around the entire tooth germ, inclosing it in a fibrous sac. Very soon after this stage of development is reached, calcification begins and in the following manner; the cells on the outer layer of the papilla are developed into the odontoblasts, and the inner tunic of the enamel organ develops into ameloblasts. These two layers of cells lie in juxtaposition, the ameloblasts being on the outside, and here is the beginning of the dento-enamel junction. From this point the odontoblasts lay down the dentin from without inward and the ameloblasts form and calcify the enamel from within outward, the dentin slightly preceding the enamel. This process then continues for some time and the tooth is about to begin its eruptive process when the cementum is developed or laid down in laminae from the inner surface of the follicle. When cementification begins, the outer surface of the dentin is then fully developed and any increase in the circumference of the root will be produced by the cementum. The enamel, on the other hand, seems also to be laid down entirely, especially in the gingival portion, but seemingly not always. This process then continues until the tooth is entirely completed after it is erupted. There is, however, a constant change in the cementum throughout the life of the tooth and this tissue becomes thicker as age advances. The outer layer of the dental follicle or sac remains as a permanent structure, the alveolodental membrane. This membrane becomes contiguous to the inner surface of the free gum margin when the tooth is erupted.

This very brief consideration of the embryology is an important review so that we can more clearly understand the reasons for its histological make-up. It is in the study of the histology and anatomy of this region that the evidence for a better conservation of these structures in our procedure *must* become apparent.

It would perhaps be presuming too much to review the histology minutely. However, it is necessary to have it clearly in mind in the formulation of a procedure, and therefore, a consideration of both the soft and hard tissues of this area will be undertaken.

From the histological standpoint the

alveolodental membrane is a characteristic connective tissue having the generative, physical, and sensory functions. Besides containing the cells to tear down and build up both the alveolus and the cementum, it is very vascular and has a good nerve supply, and serves as a very firm attachment of the tooth to the alveolus thru the medium of its fibers. The portion of this membrane that concerns most the subject under consideration is the gingival portion; that portion extending from the alveolar border crownwise to the periphery of the gingival tissue. In this area the fibers radiate outward from their attachment to the cementum into the structure immediately surrounding. The fibers nearer the surface radiate outward for a short distance and then extend crownward into the gingivae uniting with the fibrous mat supporting the epithelium. These fibers are stronger on the lingual side. A little deeper the fibers on the lingual and the labial pass out at right angles into the coarser fibrous mat of the gum tissues, while on the proximal sides they pass directly across this space and into the cementum of the adjoining tooth, at the same time interlacing with the fibers coming from this adjoining tooth. These are the fibers that are of the greatest importance in supporting the interproximal tissues.

Still a little deeper the fibers form into larger bundles and unite with the fibers of the periosteum. Farther apically the fibers are disposed in a varying manner into the alveolus. From this it will be seen how beautifully the gingivae are supported and at the same time how they are drawn firmly around the necks of the teeth so that injury is avoided and infection is not retained.

The cementum is a connective tissue substance closely allied to bone. Generally speaking, it is laid down in laminae and it is the thinnest at the cervical portion of the root. The first or foundation layer is the more homogenous structure in that it is of an unbroken, granular appearance and possesses neither striations nor fibers and a very few cement corpuscles. The subsequent layers or laminae differ from this first one in that the fibers of the membrane penetrate the developing tissue and later become a part of it. Different layers of it are laid down during the life of the tooth but not necessarily evenly. Usually more and thicker layers will be found near and around the apex of a root than at the cervical portion.

The profession is more familiar with the general histology of the enamel. This tissue is the densest in the human body and is composed of a series of hexagonal prisms spoken of as enamel rods. These prisms are set upon end on the surface of the crown portion of the dentin and radiate outward, at the same time, having a gnarled or wavy course to the surface. Their general direction to that of the surface is at right angles. The thickness of the enamel, of course, varies on the different surfaces of the crown. It is fairly constant on the lateral surfaces and as one approaches the neck of the tooth it becomes thinner, finally terminating at the gingival line. The anatomy of that portion of a crown that is covered by the gingivae is due entirely to the enamel, because, as was found by Orton and Damon, at the University of Minnesota, the walls of the dentin are practically parallel in this region. Here also the direction of the enamel rods will be found to be at right angles to the surface. This does not mean that the direction of the rods is at right angles to the long axis of the tooth, for they are not generally, but they diverge something like 6° C. gingivally. Because of the constant contouring of this surface these rods assume approximately a right angle to the surface.

Anatomically, the gingivae extend from

the actual attachment to the cementum for a variable distance crownwise, depending on the location of the tooth and largely on the age of the patient. This sleeve of tissue then normally covers an area of enamel and sometimes a small area of dentin between its attachment and the periphery.

Not much has been written about the ending of the enamel and the cementum in this region by our histologists, except by Choquet and Thorsen. These men have directed special study on this area and have done admirable work. Choquet was possibly the first to present definite and more elaborate information on this subject, which was followed by Thorsen, whose work is the more extensive and at the same time more reliable. It was found by these investigators that the enamel and the cementum do not end in a uniformly similar way and that this even differs on the same tooth in some cases. Thorsen in his work selected teeth regardless of age and quotes his findings as follows:

1. The cementum overlaps the margin of enamel in from 60 to 65 per cent of all teeth examined.

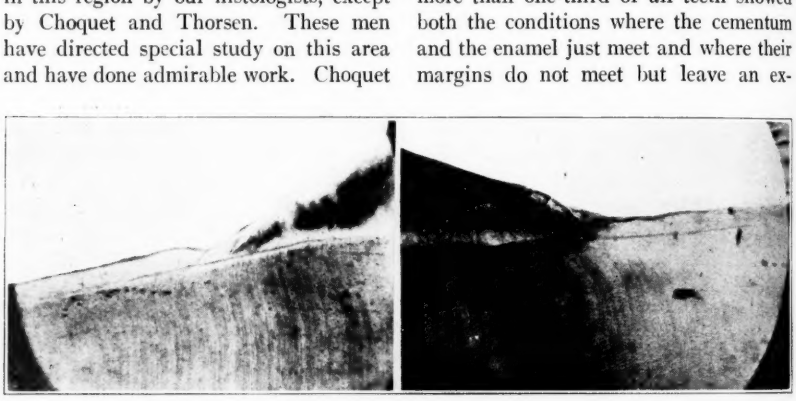
2. The margins of enamel and cementum meet in about 30 per cent of the teeth.

3. There remains a distance or space between the cementum and enamel with a consequent exposure of the dentin in from 5 to 10 per cent of the teeth.

4. The enamel was found to overlap the cementum in one case only.

It will be observed from this that about 60 per cent or more, or in other words, two-thirds of all teeth examined showed that the cementum overlapped the margin of enamel for a variable distance. Slightly more than one-third of all teeth showed both the conditions where the cementum and the enamel just meet and where their margins do not meet but leave an exposure of the dentin. Then it will also be observed that the enamel overlaps the cementum very infrequently; in his work in only one tooth examined. From the standpoint of embryology it is hard to understand how this can occur and it seems to be a queston whether this is not an error in technic.

I believe that Thorsen's work reliably shows us the condition of the cemento-enamel junction. His percentages of the four conditions differ considerably from the findings of Choquet, but whether his percentages are exactly correct does not make so very great a difference. The work of these men is not known to the



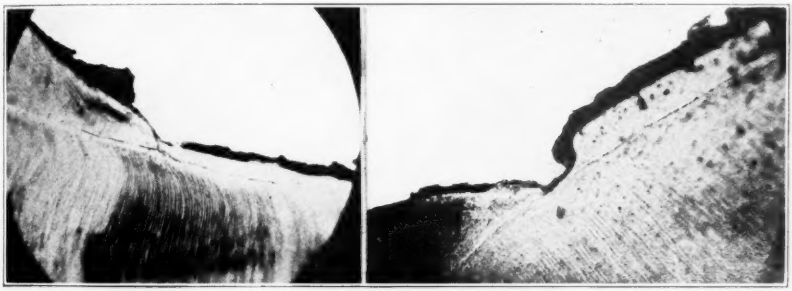
1 2

Figs. 1 and 2.—In Fig. 1 the cementum is seen to overlap the enamel. This overlapping was found to occur in from 60 to 65 per cent of the teeth examined. Fig. 2 shows a greater overlapping of the cementum. (Thorsen).

dental profession in America, except in a few instances. We have therefore not been able to recognize it in our reasonings.

If the knowledge of this relationship of these tissues has any bearing on our procedures, then it must be understood and our methods must be made to best conform with the anatomical requirements of this area. With this in view, it will be interesting to compare our past methods in the light of a knowledge of the gingival anatomy as it really is.

Thorsen classifies the conditions most frequently met with first. The first condition is where the cementum overlaps the enamel for a short distance which varies in different teeth and this relationship occurs in two out of three teeth. Here at the outset it must be apparent to us that the condition itself defeats our object. In the teeth of normal membrane attachment, bearing such a relationship, how is it possible to remove all of the enamel and not irreparably mutilate the fibers of attachment? In a serious consideration of this condition does it seem reasonable that it can be done? Condition No. 2 is slightly different in that the enamel and the cementum meet edge to edge. Possibly here we can also include condition No. 4, in our consideration, where the enamel overlaps the cementum, because from the viewpoint of the operator the proximation of the soft tissues seems to be very similar. Can all of the enamel be removed in these cases, and are we sure that we are doing it when we attempt it? The cemento-enamel relationship in condition No. 3, at first sight, seems to favor our purpose. Thorsen, however, states that the dentin that is exposed between the margins of the enamel and the cementum is found to be protected by the root membrane. It would seem then that this class of cases is no more easily handled than the two previous conditions. It will be observed by this time that two-thirds of all teeth with normal tissue attachment, present with an anatomical relationship that makes it impossible to remove the enamel entirely unless a portion of the cementum is also removed. The remaining one tooth is found to be more like what we have believed the condition to be, and here at best a most careful and accurate technic is required if we desire to remove the



3 4

Figs. 3 and 4.—While Fig. 3 shows a slight overlapping of the cementum, there is more of an end to end meeting of the enamel and cementum. Such a condition was found in 30 per cent of the teeth examined. Fig. 4 shows a space between the margins of the enamel and cementum. This condition was found in from 5 to 10 per cent of the cases. (Thorsen).

enamel properly. Permit me to quote Orton in this connection. He states that "the removal of the enamel from the dentin, for a space upward of 3 mm. underneath the gum tissue without doing injury to the gum tissue and the periodontal attachment, requires so high a degree of surgical skill, and is so laborious an operation, burdensome alike to the patient and operator, that we would like to be quite sure of its necessity before insisting upon it as a normal procedure."

Right here it will not be presumptuous to ask, why is it or is it not necessary to remove all of the enamel in a preparation for a porcelain veneer crown? It will be most fascinating to compare the reasons that are usually given for and against the removal of this enamel.

The friability of the unsupported enamel rods is the important reason for the entire removal of the enamel. It is the contention of the followers of this technic that because of the shortness and direction of the enamel rods in this region they cannot be safely dressed down or supported. Those who condemn this procedure give for their reasons the seriousness of tissue injury, which can hardly be avoided even by the most skilful, the impossibility of restoring the correct anatomy when it is once removed, and the protection that is naturally afforded this margin by the soft structures.

Here, it will be convenient to again recall that two out of every three teeth with normal attachment present a condition that is not conducive to a proper removal of the enamel. This is then an important argument against the removal of the enamel entirely in this class of cases at least. No one will deny the fact that it is impossible after the enamel has been once removed, to accurately duplicate this gingival anatomy that the enamel gives to a tooth. Not only is there a variation in the thickness of this portion of the enamel on the different surfaces but the gingival line does not extend around the circumference of a tooth symmetrically but presents a more or less zigzag line. As long as there remains a portion of the enamel it will serve to guide us in a more accurate replacement of it in our restoration.

This brings us to the question of what happens to the enamel if it is left and the porcelain is placed against it. This at once implies another question, How was this enamel left? It would obviously be folly to argue unless it were known what means were used to remove the short unsupported enamel rods. In the consideration of the histology of the enamel you will remember that it was stated that the rods in this region do not meet the surface at right angles to the long axis of the tooth but that they diverge about 6° C. gingivally. It will be noted that because of the direction of the surface in this region these rods meet the surface at right angles approximately.

The accepted preparation of a cavity for a porcelain inlay is to have the walls meet the surface at right angles. In other words, because of the convexity and the concavity of the surfaces, all the walls are to be shaped at right angles to a line drawn tangent to the surface. In leaving the walls prepared in this manner, not only will the walls have a right angled margin but the margin of porcelain will likewise assume the same angle.

Clinical experience shows that the margins of enamel around a properly placed porcelain inlay with the walls finished in this manner, do not crumble except possibly where there is direct stress brought to bear on it by the articulation. The conditions that would be brought to bear on this margin placed under the gingivae would be even more favorable because of the protection afforded it by these tissues, and with a preparation of the enamel walls as described, what might we have to fear in the permanence of this margin?

It cannot be stated that the porcelain margin is any stronger or that it receives any better protection where all of the enamel is removed than where it is not removed and is shaped properly. Another point then comes to our attention and that is the relative strength of the margins of enamel and porcelain. Is it not obvious that the porcelain margin is not the more sturdy of the two at least?

It need not be stated that it is our purpose to do prophylactic dentistry. Whether or not a mode of procedure or a type of restoration is prophylactic is the supreme test for it, and it will stand or fall on these merits. Pathology portrays too often the harmful results that are produced by the severance of the superficial fibers of the alveolodental membrane or by an unfavorable condition that is produced thereby and which results in injury and infection to the soft tissues.

Histology points out that this gingival structure is the most vulnerable structure in the human body, for the reason that it is the only region where there is no protection. The epithelium that covers the gum tissue is of a stratified squamous variety made up of many layers of cells and with a distinct horny or corneous layer on the surface. Where it turns over into the gum cuff the corneous layer entirely disappears and the cells are very much softer in structure, larger and more loosely placed, and of fewer layers. The significant fact to be borne in mind is that this epithelium does not come up to the tooth and that there is an unprotected space between the ending of the cells and the tooth proper, which is simply filled with connective tissue, blood vessels, and the fibers of the root membrane. This is the region under which we do and are to place our margins. Is there any wonder why it is necessary to avoid injury and any unfavorable condition of either injury or tooth anatomy that will produce a pathological condition later?

Noyes states that after the severing of fibers of the root membrane there can be a regeneration of these fibers but that it is a biological problem and that it possibly does not occur very frequently.

The question as to whether or not we will find it necessary to remove all of the enamel of a tooth in our preparation for a veneer crown, especially from a tooth with normal attachment, will finally dispose of itself. The members of the profession, in seeking after the truth, will, after proper consideration and mature deliberation, formulate a procedure that will be based on the true conditions and for the best interests of the patient, but it is well for us to state our problem and in that way bring it to an earlier climax.

Bibliography

Black, G. V. *Periosteum and Peridental Membrane.*

Black, G. V. *Special Dental Pathology.*

Broomell, I. Norman, and Fischelis, Philip. *Anatomy and Histology of the Mouth and Teeth.*

Hopewell-Smith, Arthur. *Normal Histology,* Vol I.

Noyes, F. B. *Dental Histology and Embryology.*

Orton, Forrest H. *Fundamental Principles in Crown Work.*

Sudduth, W. X. *American System of Dentistry,* Vol. I.

Thorsen, Gunnar. *The Gingival Portion of the Tooth in Connection with Some Researches on the Relation Between the Enamel and Cementum.*

THE PUBLIC SERVICE RELATIONS OF DENTISTRY

By EDWARD C. KIRK, D.D.S., Sc.D., LL.D., Philadelphia, Pennsylvania

(Read before The Guild of St. Apollonia, Boston, Mass., May 22, 1922)

IT IS now eighty-three years since the founders of organized dentistry pre-empted their claim for the recognition of dentistry as a professional calling. To Horace H. Hayden and Chapin A. Harris were vouchsafed a vision. Not only were they pioneers true to type, but seers as well. They saw the dentistry of their day as a mechanical handicraft, the training in its "art and mystery" hedged about by the limitations of the apprenticeship system, a relic of the ancient trade guild laws, imbued with the spirit of selfish competition and devoid of every attribute educationally and ethically characteristic of a liberal profession.

The founding of the Baltimore College of Dental Surgery, of the American Society of Dental Surgeons and of the American Journal of Dental Science by these pioneers are historic events that in a material sense collectively signalized the professional birth of dentistry and launched it upon a career fraught with limitless possibilities. The events of history, however, are not the essence of history; they are merely the material expressions of the animating motives or emotions of individuals and peoples. It is the motive behind the event that challenges the interest of the student of history, for by the light which the study of these impulses throws upon the causes of past events one is able to grasp their meaning and to appreciate something of the course of human development toward the future.

The amimating motive of Hayden and Harris was the outgrowth of their conception that dentistry in its essence is a profession and the great work of their lives was the effort to practically demonstrate the validity of that conception. What did they mean by the term "profession" as applied to dentistry; what do we mean as we continually use it to designate our calling?

It is desirable and indeed important that we should have some rather definite notions as to what we mean when we apply that nebulous word "profession" to dentistry. I find these definitions in two standard dictionaries: "An occupation that properly involves a liberal education or its equivalent and mental rather than manual labor." "Any calling or occupation involving special mental and other attainments or special discipline," or "a profession is expressly that kind of business which deals primarily with men as men and is thus distinguished from a trade which provides for the external wants or occasions of men."

Taking these definitions collectively they present a fairly comprehensive statement of those factors that are fundamental to a correct conception of a professional standard.

In earlier days when learning was the exclusive prerogative of the well-to-do,

there were but three professions recognized as learned, viz: law, medicine, and divinity. The monopoly of learning unfortunately bred social class distinctions that are disappearing before the accumulation of knowledge and universal freedom of education in modern times which has also wrought a corresponding liberalizing of thought, an increase in the number of professions justly entitled to the designation learned and, what is still more striking, a wholesome democratizing of the social fabric by the obliteration of artificial class distinctions.

The professional status of dentistry as we view it today is far different from what it was when Hayden and Harris launched their professional ideal. The ancient monopoly of the three learned professions was then dominant and the attempt to foist upon this autocratic triumvirate a fourth aspirant for professional honors was resented as an impertinence. The dental professional infant was sent forth into a hostile world after an unsuccessful attempt upon the part of its sponsors to secure its adoption by its maternal ancestor, the mother of all the medical specialties.

The infancy and adolescence of dentistry as a profession was handicapped by its mechanical heritage. Notwithstanding the fact that the foundations of its educational structure had been securely laid in those branches of learning fundamental to the whole science and art of healing, the large part played by mechanics in the art of dentistry continued to be its most evident and outstanding characteristic. The training necessary to acquire proficiency in the manipulative procedures of dentistry became the most impressive feature of the dental curriculum and dentistry especially in America achieved distinction from its facility and ingenuity, its resourcefulness in devising and skill in executing the delicate mechanical procedures characteristic of its service. So dominant was the ideal of mechanical excellence in the dental educational field that the therapeutic phase of dental service played a distinctly subordinate role throughout what may be characterized as the formative period of dental professional life and this mechanical trend of dental education and dental service as well unquestionably operated as an obstacle to the attainment of that professional status which the fathers of dentistry foresaw as its destiny and the recognition of the right to which was constantly demanded by its devotees.

One of the definitions of a profession, already quoted, distinguishes a profession from a trade as a business that deals primarily with men as men while a trade provides for the external want or occasions of men. The dominance of the mechanical ideal as such introduced and for a time maintained a factor of trade in dental service that obscured its professional status. In its restorative operations a price determined by the cost of material and time expended was charged for the products of dental handicraft, and not for the service rendered on the basis of the educated specialized intelligence of the professional consultant.

In the meantime a countercurrent of scientific activity operating as a vitalizing influence on the professional side was gradually making its importance felt. The researches of Miller upon the causation of dental caries and the pathogenic flora of the mouth directed the attention of the whole profession to the importance of the pathological aspect of dental activity and focused both dental and medical interest upon the vital as distinguished from the mechanical factor in the dental problem. It soon became manifest that the integrity of a restorative dental operation was quite as much dependent upon the vital reactions of its living support as it was upon the technical perfection of the mechanism itself.

The rapid growth of the science of bacterio-pathology and the application of its

research methods to the study of the oral cavity revealed the astounding fact that the human mouth is the portal of entry, the incubator and habitat of bacterial forms of life, many of which are the originators of both local and general disease—a conception that has not only revolutionized dental technic in all of its phases, but that has done more than any one thing to readjust the mechanical ideal in dentistry and establish its professional status as a department of the science and art of healing.

The direct outgrowth of the work of Miller and his followers upon the human mouth as a focus of infection is the widespread interest in the so-called oral hygiene movement which is now practically universal. So intense is this interest that the demand for means to combat the menace to health which the unhygienic mouth cavity involves is being made with increasing insistence and is becoming of such public importance that municipalities, states, and nations are now concerned with the solution of the problem. Not only is oral hygiene being demanded as a prophylactic measure, but all dental restorative technic is being brought under critical review not from the constructive mechanical point of view, but with respect to its hygienic integrity. As in all transitional phases of reform it seems to be inevitable that extremists with limited vision should arise and clamor for drastic means to accomplish their desired ends, so at the present, as for some time past, there have not been lacking extremists both in medicine and dentistry whose astigmatic vision can see no other solution for a dental disease than the extracting forceps.

A noted physician once said that the amputation of a limb is the practical confession of surgical failure. It is probably equally true that the routine extraction of pulpless teeth is the practical confession of dental ignorance and as study and experience bring knowledge and wisdom we shall no doubt arrive at a more just and conservative attitude of mind than these extremists manifest regarding the salvation of human teeth.

The present "spurlos versenkt" policy characteristic of the 100 per cent vitalists may be regarded as only one of the waste products of the evolutional development of dentistry toward an educated professionalism.

I have dwelt at some length upon the historical phase of the subject in order to emphasize by a study of the growth motives of dentistry the fact that we have developed as a profession just in proportion to the extent that we have broadened our educational outlook and attainment by cultivating those fields of research that relate to human life in the physical sense and by regarding our mechanical ideals as means for the preservation and prolongation of comfortable human existence rather than as ends in themselves.

Dentistry since its organization has clamored insistently for recognition as a profession. Today it may be said without fear of successful contradiction to have achieved that recognition, by which I mean that the realization of the direct relation which its field of special activity bears to bodily health is a generally accepted fact, so that in the nature of its work and the educational equipment of its representatives, dentistry is fairly justified in its claim to professional status.

With the enlarged recognition has developed a corresponding opportunity and an equivalent responsibility. The oral hygiene propaganda promoted in the beginning by dentists has now expanded beyond the dental profession and is being carried on by medical teachers, by hygienists, by lay educational teachers, through the public press, in private institutions, in manufacturing industries, in insurance companies, by city, state and national governments, so that the public

at large is being imbued with the gospel of the hygienic mouth as a protection against bodily ill health. All this educational activity has borne its fruit in a demand for dental service that is sweeping over the world like a tidal wave and we are confronted with the problem of how the demand shall be met.

It is not my purpose to discuss in a detailed way plans of organizations for dealing practically with the problem. What appeals to me as of more fundamental importance is what must be our professional attitude toward the problem, how shall we regard our responsibility toward it and in what spirit shall we attempt its solution.

Let us frankly recognize first of all that the demand for public dental service is a demand of our own creation. From the beginning we have preached the importance of dental care as a means for the preservation of health. It is true that in the earlier stages of our knowledge of the subject a major emphasis was placed upon the necessity for the complete restoration of defects or losses in the dental apparatus in order that the function of food mastication, insalivation and mouth digestion might be restored to the normal physiological standard. This was the main argument put forth in defense of conservative and restorative dental technic during the period of domination by the mechanical ideal. The new epoch of oral hygiene introduced by the bacteriologic researches of Miller on the mouth as a focus of infection and vividly emphasized by the later clinical findings of Sir William Hunter as to the systemic relations of oral infection furnished the conclusive and convincing basis of argument that has ultimately created the widespread demand for dental service that now confronts us as a profession.

I know of no more comprehensive portrayal of the character and extent of the demand for public dental service from the lay point of view than that embodied in an article by Michael M. Davis, Jr., of New York, published in the May issue *Dental Cosmos*. The paper is a constructive effort to make dentistry available to the whole public. I commend it to your attention for its practical suggestiveness.

At the root of any plan for the extension of dental service to the general public in any comprehensive sense is the fact that the present total number of dental practitioners is wholly inadequate for the task. There are about 60,000 dentists in practice in the United States at the present time. The total population is approximately 110,000,000 or roughly about two thousand people per dentist. It is estimated that a dentist cannot within his average working hours per day give adequate care to more than five hundred patients per year. Moreover, the great bulk of his work is conservative and reparative, leaving insufficient time, often no time, for preventive, prophylactic treatments.

It is this latter aspect of dentistry that is looming large as to its importance in the public service field. The greatest public benefit within the power of dentistry to confer is the utilization of its intelligence and specialized skill in the conservation of health by the prevention of dental disease. To partially meet this need the calling of the dental hygienist as an adjuvant to the dental profession has been created. This is a forward step in the right direction, but even if indefinitely multiplied it does not wholly meet the requirements of the situation.

A greater number of qualified dental practitioners and an enlarged spirit of service are needed to successfully cope with the situation.

A review of present dental educational conditions clearly indicates that the annual increment of dental graduates signally fails to increase the total number of practitioners in anything like the re-

quired ratio to the growing public demand. Unless some fundamental readjustment of our educational scheme is brought about or other means are instituted to increase the annual output of dental practitioners we must in the course of time drift into a situation analogous to that which has wrought a complete upheaval of dental educational processes in England by invoking the direct interference of the state which acting clearly within its rights has demanded and provided the means by which an adequate supply of dental practitioners shall be had to meet the health requirements of its people.

I have suggested a possible modification in our educational system as a means to the end under consideration. I approach this phase of the subject with a degree of hesitation from the fear that my position in the matter may be misinterpreted to mean a plea for the lowering of dental educational standards, which I wish to definitely and expressly disclaim.

What I wish to suggest is a revision and reclassification of the dental curriculum whereby those of its phases that may be designated as ultra scientific shall be relegated to the catagory of postgraduate studies and the curriculum leading to the qualification for practice be confined to those subjects essential to the making of a practitioner safe to intrust with that phase of the public health, which it is his providence to practically care for and safeguard. I would have him so grounded in general principles and equipped with such an intelligent appreciation of the applications of principles to practice as when combined with a trained manipulative ability he would be competent to practice his profession. I would, for example, have him able to correctly read a roentgenogram, to understand the purport of a clinical laboratory report and to understand the physiological significance of the endocrine activities or the nutritional value of the vitamines, but I would omit from his elementary dental education an intimate knowledge of the physics of radiant energy by virtue of which the X-ray is possible and likewise I should omit analogous training in the biochemistry of endocrine hormones and similar fields of specialized knowledge suitable to the education of the expert specialist, but in large degree superfluous for the undergraduate who at least at the outset of his career will functionate mainly as a general practitioner.

Such a reclassification as I have here indicated is not a lowering of standards, but rather an attempt at the practical adaptation of means to ends which, insofar as it may accomplish that object, is to my mind a raising rather than a lowering of the dental educational standard.

In view of the possibility of such a reclassification of the dental curriculum it is easy to foresee that it might lead ultimately to a dual qualification in dentistry as is already the case in the English and continental medical profession, viz: the licentiate and the doctorate, or as in the Arts and Sciences, where we have the Bachelor's and Master's qualifications respectively.

I have mentioned a larger spirit of service as one of the fundamental needs in the solution of the problem before us. In that connection let me refer to the matter of state board of control of dental licensure. An experience of many years of intimate relationship with dental state board activities has led me to the conclusion that in a large number of instances the policy of the state dental examiner is exclusive rather than inclusive, by which I mean that under the guise of an effort to safeguard the commonwealth from the activities of incompetent practitioners the examiner is too often either consciously or unconsciously safeguarding himself and his colleagues from professional competition. I gather this from the many in-

stances that have come to my notice where candidates have failed to pass because of trifling technicalities, and often because of lack of knowledge of some minor individual fad of the examiner that has formed the basis of a question. This factor has in my opinion operated in no small degree as a barrier to the service that the public urgently demands. A more liberal interpretation of the spirit of dental legislation would have a wholesome effect in furthering the purpose of the state to secure the dental service which it needs.

And finally, even though I may lay myself open to a charge of idealism, let me say that we need for ourselves a broadening of the spirit of true professionalism in order to fairly solve our problem of public dental service.

We have loudly proclaimed the importance of our work, we have advertised our claims to recognition by reason of the vital relations which dentistry holds to the scheme of public health conservation, all of which is true and the public has accepted it as true. At the same time the fees that we have demanded have not grown less but greater as the demand for dental service has increased. On the whole, as individuals we have been too busy with well paid work to give much if any individual attention to the requirements of the great mass of humanity whose dental need is as great but whose resources are much less than the favored clientele that we serve.

The spirit of public service as a dental professional attribute is growing as witnessed by the self-sacrificing labors of many whose devoted service has been a benefaction to our profession, to humanity and to themselves, but more is needed. Lord Bacon's aphorism that every man is a debtor to his profession is true even if trite, but a true spirit of professionalism recognizes a still larger obligation in its debt to humanity and each must pay that debt in his own coin which is the medium of his individual specialized service. It is the spirit in which he renders that service that determines the measure of his reward. Much of it is done for personal aggrandizement and the hope of the material compensation resulting from an enlarged patronage, or it may be undertaken as a duty to be performed in the spirit of one who contributes to a charity in the hope of balancing his account in the heavenly ledger, or he may give his public service in the assurance of that greatest of all rewards, the joy that comes from the discovery that "it is more blessed to give than to receive."

I have in a desultory way endeavored to portray the general features of a problem that in the course of our development now confronts us. It is a situation largely of our own creation and, as I view it, all the circumstances point to the conclusion that the responsibility for its correct solution rests upon us of the dental profession. It is my belief that when dentistry as a whole shall awaken to a consciousness of its birthright and is imbued with a realizing sense of its great opportunity, then in spirit of true professional service its ministrations will be for the healing of the nations.

THE DOUBTFUL INTERRELATIONSHIP BETWEEN INFECTED TEETH AND GENERAL DISEASE[1]

By H. SCHOTTMUELLER, M.D., Berlin, Germany

IT IS not to be doubted that a possibility exists of infected and inflamed teeth conditions having some influence on the general organism, even though this influence may only be moderate and in a very circumscribed manner, just as any other infection anywhere in the body, as for instance the presence of a furuncle, may have some minor results elsewhere, in a very minor way or none whatever, depending on the general resistive power of the individual.

But during the past ten years and mainly by American dentists and physicians it has not only been said that infected teeth have a pronounced influence on the general organism; in fact it has been held by them that even serious damage to the general organism is apt to result, but that deflnite specially localized organic disease has been ascribed by them to dental infection.

Dr. Martin H. Fischer tries to substantiate his claims by citing many clinical examples, and tries to prove his theories by them.

Notwithstanding the close interrelationship which exists between the teeth and the fifth nerve doubt is at once awakened when Fischer states that in thirteen cases of tri-facial neuralgia twelve times infections of the teeth were primary cause. One of these cases described by Fischer in minute detail shows best how very poorly he judges the influence of dental disturbance.

A physician developed a weakness in the right arm with pain, produced mainly by pressure on the plexus brachialis, from a thickening of the osseous parts in the neck vertebrae which was shown by X-ray examination. This patient had, previous to this, lost all but five of his teeth, and these received regular and careful attention. As this painful weakness lasted three years it was decided to remove these five teeth. A few weeks later the arm was again perfectly normal. Surely these five teeth could not have caused this weakness.

Let us look for some examples of proof that patients with Basedow's or thyroid disease according to his observations, have poor teeth, and that (although he does not definitely say so) an improvement in the symptoms occurred soon after the treatment of the teeth, which was sufficient reason for him to ascribe the hyperthyroidism to the diseased condition of the teeth. He adds as proof further experimental work by Dr. E. C. Rosenow. Rosenow isolated streptococcic organisms from human beings affected by thyroidism, infected a number of dogs with these, and produced symptoms of hyperthyroidism in them. Of course it would be ridiculous to accept such animal experiments as proof without a good deal of further experimental work.

In like manner Fischer claims that by the removal of a poor bridge and the extraction of two infected teeth, his patient was relieved of a myocarditis in fourteen days. He claims that the teeth were the original cause of the trouble.

Aside from the error in judgment, that the removal of the original seat of infection could in such a case have any influ-

[1]Translated by H. H. Schuhmann, M.D., D.D.S., Chicago, Illinois.

ence whatever on the distant metastasis, the disappearance of the symptoms does by no means prove to have been due to the treatment of the teeth, for nothing is more inconsistent than the change in the appearance of irregularities of the heart-beat in a myocarditis. Further, ulcer of the ventricle colecystitis, appendicitis, articular rheumatism, in the most varied forms, climateric disturbances, old-age disturbances, nervous hypochondriac conditions, arteriosclerosis and finally also Brights disease are diseased conditions which according to Dr. Fischer's method of proof frequently are caused by dental and alveolar disturbances.

In this effort of seeking proof he relies on the findings of Wherry, of whose patients many were not confined to the bed and who were in the hospital for various mild affections. Many of these were mistrusted as malingerers, a few, suffered from auto-intoxication, migraine and chronic gout. Many, if not all, were subjects of low-grade general infections resulting from very chronic type.

Fischer and many other authorities in America imagine that the interrelationship of dental infection and general health is due to the fact that either periodically, or during a long time, streptococci, get into the blood from these dental infections, no matter how small or slight they might be, and then either by metastasis or through their toxins produce harm in the general organism.

This dental infection is supposed to lead to a septic infection and particularly to a chronic septic condition.

Without doubt, during our many years of clinical work we have learned that an infection from a tooth can lead to cases of *acute* sepsis and death and osteomyelitis, but surely these are very rare cases, which in no way simulate the cases which Fischer cites for the purpose of proving his theories.

Sepsis does not mean the numerical increase of the bacteria in the blood-stream, but it means that somewhere in the body a nidus is created from which either continually or at intervals bacteria (maybe streptococci) are sent into the blood stream, with the production of disease symptoms.

Such a septic nidus must be *very definitely* and *peculiarly constituted,* namely there must be *a very free opening,* into the blood stream. We find such a septic nidus in the form of an infected thrombus in a blood vessel, or in endophlebitis or in a lymphangitis, or by bacterial deposit *inside* of the arterial system. But only if this infection occurs in the *largest* arteries can a sepsis develop. Ordinary abscesses, such as occur on the teeth and in the alveolus, are either through their anatomical position or by granulation walls so shut off from the larger vessels of the blood stream that unless we can imagine very large areas infected filled with pus accumulations under very severe pressure a resulting sepsis or reinfection is absolutely unthinkable. Such might occur in the uterus or gallbladder.

It is a great question if disease-producing infections on the teeth, which would have the necessary attributes to produce a sepsis, can even be imagined to be present in the slightest degree.

We all know that even from a simple abscess or infection anywhere in the organism a few unimportant bacteria may eventually get into the circulation. We therefore are willing to accept such a possibility in certain cases of inflamed and infected teeth. However, as clinical evidence of such a procedure, we shall certainly expect such symptoms as slight pain followed by swelling of adjacent lymph glands in the region of the affected teeth. But as a rule in these cases the process is surely a harmless localized one and has nothing whatever to do with a nidus of infection.

A nidus in the infected pulp of a tooth or at the apex or even in the periosteum, can never at any time have the necessary properties of a focus of infection such as will be necessary to result in infections elsewhere. I have never seen any chronic septic condition in which a bacterial in-

fection at the root end of a tooth or in its proximity could possibly have been an etiologic factor in the creation of such a secondary infection.

I must characterize as an unpardonable flight of imagination such words of Fischer as these: "I must admit that I am impressed when the blood examinations of patients who after careful clinical diagnosis show nothing else but poor teeth and poor gums, show large colonies of streptococci."

It would take too long to mention all the reasons which could be cited against such claims. Depending upon the findings of Rosenow, Fischer believes the streptococcus viridans to be the principal carrier of the many diseased conditions above mentioned. According to Fischer's belief these streptococci, from dental infections, find their way into the blood stream and by metastatic means find a way to produce gastric and duodenal ulcers, ulcers in the gallbladder and appendix infections. No proof of this universal pathogenicity of the streptococcus viridans, through the embolic road, such as claimed by Rosenow has ever been produced.

Admitted that a streptococcus viridans could be the cause of dental infection, it could never occur from such a seat of infection in the quantity, nor in the time necessary to produce a sepsis in the blood. One must by no means confuse an infected area with a focus of infection. A *bacterial* infection is never to be considered the same as a *focus* of infection.

It is possible that a streptococcus viridans, occasionally coming from an infection in the mouth, may eventually possibly reach the blood stream and attach itself somewhere in the body. Thus it is possible that a streptococcus viridans may become so localized in this manner that it would produce what clinicians would term chronic sepsis and endocarditis lenta. Fortunately cases of endocarditis lenta, in comparison with the number of cases mentioned by Fischer, which he believes possible of having their origin in dental infection, are extraordinarily rare, and only a small percentage of them could ever be ascribed to dental infection.

The pathology of this disease must be understood to show the fallacy of the standpoint by Fischer and other authorities take to prove their theories.

Regarding this disease, which lasts for many years and in which we have demonstrated many times the large quantities of streptococcus viridans floating in the blood stream, we have *not once* found any of these secondary infections, which Dr. Fischer mentions to be caused by the mere possibility of a few distant streptococci possibly gaining occasional access to the blood stream. Therefore our experience in these cases of chronic endocarditis, caused by the streptococcus viridans, is one of the main arguments to entirely disprove any of the claims of Fischer and others.

Further, in my clinic at least ten thousand bacterial blood examinations were made and in every case when it was possible to cultivate any bacteria found in the blood, we have been enabled invariably to find the focus of infection, and have never in a single instance found the focus to be of dental origin.

Bacterial examinations of dental lesions and unquestionable culture methods, to prove any bacterial research work of the nature of dental infections, do not exist at the present time, at least only in a very doubtful and unreliable measure. We have begun to interest ourselves in this subject, and as far as our experience in these investigations have carried us, we found anaerobic bacteria in all cases of pus producing infections in the dental pulp or at the root apex. Thus we once found a streptococcus putrificus and at another time a staphylococcus organism which only grew under anaerobic conditions. From our general knowledge of pathology we know that wherever a pus infection occurs in the body it will be found to be due to anaerobic bacteria, and we have found that the

pus infections in and about the teeth substantiate this experience.

Inasmuch as Fischer lays particular stress on the researches of Dr. Rosenow, let me say a few words regarding these. One of the main reasons which Dr. Rosenow finds for his understanding of chronic infections and which he claims to have proved experimentally is that he does not believe that different kinds of streptococci exist, but that the various forms which we are able to find are all the same streptococci in different stages of development. In other words the streptococcus viridans according to these views is supposed to be an ordinary streptococcus in which the virulence has been diminished.

I have repeatedly stated that no certain proof of such conceptions has yet been offered. In this connection I am looking at the question from a purely bacteriological standpoint and I desire to emphasize the fact that we never have been able to demonstrate the change from streptococcus pyogenus or hemolyticus into a streptococcus viridans, notwithstanding our close observation in numberless cases.

To what consequences a conception of the matter such as stated by the above mentioned American physician would lead I shall endeavor to illustrate, by citing two examples of a very recent experience. A patient who was treated by me for many years, for a neurasthenic condition moved to America. Since then I have heard that she was treated there for the same trouble. The cause of her trouble was determined to be due to some of her teeth, and for that reason they were all extracted, resulting naturally, without the slightest improvement.

Another patient suffered from septic fever for four months, during which time the blood stream was infected, but up to that time we had not been able to determine the source of this infection. To show how the error of these ideas of Fischer, Rosenow and many other American physicians had begun to take hold, even of German physicians, is shown by the fact that a well known German clinician advised the extraction of a number of teeth, notwithstanding the fact that no definite infection could be shown to exist on these teeth. Naturally, in this case also the extraction showed no influence whatever on the fever. The extracted teeth were not the cause.

These premises have regrettably resulted in absolutely wrong methods of treatment. Instead of pursuing a conservative therapy they request a radical method, consisting in the extraction of teeth whose infective possibility have in no wise been proved, and Fischer says "the only way to get out of these dental difficulties is by resorting to extractions."

The general practitioner, the internist, and the surgeon will find in my remarks regarding the interrelationship between dental infection and general disease the analogy between these ideas and those of many physicians and clinicians regarding the mouth, namely the tonsils. Some believe that all those diseases which are caused by dental foci of infection, that the tonsils are the original seat, and as a result tonsillectomies have grown to a deplorable number. In order that in my criticism of Fischer's work I may not overlook what I consider good, allow me to state in what I thoroughly concur with him. Fischer demands the strictest aespsis.

If my words have helped to convince you of the entirely wrong conception of these American ideas and to strengthen you in the belief that it is imperative in the future, wherever it is at all possible, not to extract the teeth, I shall feel that I have accomplished my purpose. I also believe that it is of the utmost importance to every physician, in order to save his patient from entirely wrong methods of treatment, to know how little right the radical treatment of American physicians and dentists has for its existence.

MALOCCLUSION AS A FACTOR IN DEFORMITY

By TOM SMITH, D.D.S., Langdon, North Dakota

(Read before the Joint Convention of the Canadian and Ontario Dental Associations, Toronto, Canada, May 19-25, 1922)

THAT there is a definite plan in nature to develop to perfection there can be no doubt. Every natural process has a definite plan that is beautiful, if not interfered with. Let us take for example the maple leaf. Every perfect maple leaf has a definite geometric balance. There is no mistaking its proportions. When it is perfect it is beautiful. When its development is interfered with by sting of insect, lack of nutrition or the unbalancing of nature's plans from any cause, it loses its naturally beautiful proportions and becomes ugly just to the same degree that it falls short of development to the definite mathematical balance. This applies not only to leaf form but also to leaf arrangement. As far back as 1878 Schwendener (6) published *The Mechanical Theory of Leaf Arrangement* and later Kerner and Oliver (2) discuss and prove that even the distribution of leaves on the circumference of the stem is entirely a mathematical arrangement.

This same idea may be followed throughout all nature. The study of chemistry proves that nature is not haphazard but absolutely definite and balanced to the most minute detail of its finest subdivision. In physics we find this same condition and a fine example is that of the crystals. In astronomy the balance is so perfect that the appearance of comets may be foretold many years in advance and to the accuracy of the fraction of a minute. In fact this great natural law of balance is universal. The presence of a Great Divine Personality with a definite design back of all this is apparent. It is evident that all things including man, were created perfect. Our Creator being perfect must of necessity have made perfect creations. He is recognized by many as the Great Geometrician and rightly so. Through abuse or disregard of definite laws much deformity has been caused and it would appear that man has fallen from physical perfection to his present condition.

In all nature we find that if there is a lack of conformity to the ideal or perfect the thing loses beauty and becomes ugly. All beauty has a mathematical basis. The ideal or beautiful is attained by function developing well-balanced geometric proportions. If function is interfered with it must follow that development to the ideal will be interfered with and there will be a consequent loss of balance and beauty.

With the foregoing as a basis it is most logical to assume that there is a definite plan in nature to develop perfect teeth with perfect occlusion, in human beings, and that there will be a definite mathematical plan underlying this whole development. If function is not interfered with, not only the occlusion and teeth but all the masticating apparatus and its associated structures as well as the whole cranium will be developed to a symmetrical harmonious relationship and upon a geometric plan (4).

It was Dr. Bonwill (4) who gave us the first scientific dimensions of which we can make practical use in the development of this theory, that of the equilateral

triangle of four inches from condyle to condyle and from the condyles to the mesio-incisal angle of the lower central incisors. This triangle is not always equilateral for the reason that function and development have not always been perfect.

Dr. Monson (4) has gone farther and

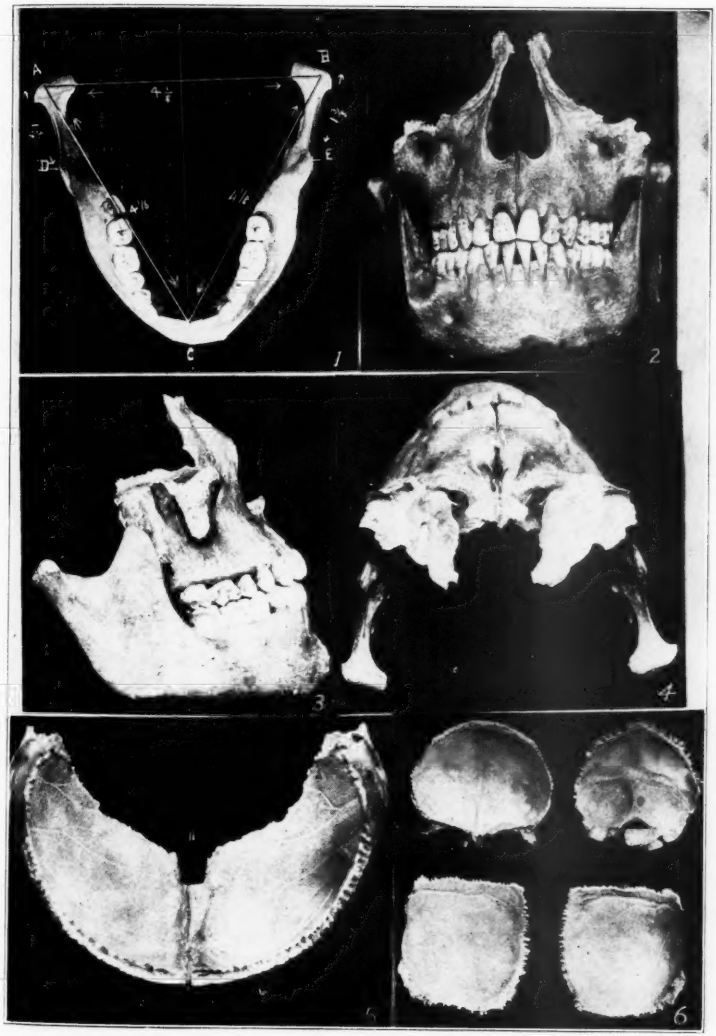


PLATE I.—BONES OF DISARTICULATED SKULL.

Fig. 1, upper view of mandible; Fig. 2, front view; Fig. 3, side view; Fig. 4, upper view; Fig. 5, inner view of the two parietal bones; Fig. 6, four bones viewed from inner side.

builds his principles of occlusion upon a geometric basis of calculation which carries with it absolute proof in every detail. This basis of his calculation is that of the figure of a sphere of approximately eight inches. The radius of this sphere is, of course, four inches.

The occluding surface of every tooth in the normal jaw will be found to be tangent to the radial line of the long axis of each tooth.

One of our chief troubles is that we have been made to study detail phases of anatomy of the teeth and of their deformities and we have neglected the study of the teeth and associated structures collectively. The result has been that no matter how fine our detail operations of repair have been they have not borne sufficient relationship to the masticating mechanism as a whole.

The bony structure of the jaws and of the whole body is built up in accordance with the amount of stress the muscles place upon it. In other words, the bony structure develops in proportion to muscle function. "Food and function equal force and form." (4) Food is the determining factor of function. Proper development to the ideal in the face and cranium must come thru proper food and function.

Plate I shows the bones of a disarticulated skull. Figure 1 is an upper view of this mandible. This is as perfect a mandible and dentition as one may find. You will observe the Bonwill triangle is equilateral, each of its three sides being four and one-eighth inches or 105 mm. These measurements were taken from the center of the condyle head as that is the rotation point. Each of the sigmoid notches is one and three-eighths inches or 35 mm. in width. In fact the various measurements of this mandible show it to be almost perfectly balanced. When this mandible is properly mounted upon the correct instrument the fact is demonstrated that the center of applied force, or the center of the sphere upon which this occlusion is developed, is equidistant from each and every cusp and is also equidistant from the center of the condyle heads. In Figures 2, 3 and 4 the teeth of the maxillae are occluded to those of the mandible: Figure 2 is a front view, Figure 3, a side view and Figure 4 an upper view. It will be observed that the maxillae are developed to the mandible and accurately balanced. Figure 5 is an inner view of the two parietal bones and here again we find accurate balance. In Figure 6 there are four bones all viewed from the inner side. Here we have another aspect of the two parietal bones which again shows their correct balance. The two upper bones are the occipital and frontal and their symmetry is perfect. In studying all of the bones of this disarticulated skull it is truly wonderful to observe their balance and beauty. This development is, of course, the result of proper function, and proper function is impossible unless all teeth are present and in correct occlusion.

Plate II is made from a skull that I was fortunate enough to find in Lincoln, Nebraska, last January. This skull is very asymmetrical. The reason is apparent. The subject had lost both lower left first and second molars and the third molar was erupted in such an abnormal position that all molar function was lost on the left side. In Figure 7 we view this mandible from above. It is very patent that the loss of the left molar function resulted in all work being forced upon the right side and consequently the development of the mandible was greater on that side. Not only the mandible but the maxilla and all of the cranial bones are much more developed on the right than on the left side. Referring to Figure 7 we find that the Bonwill triangle is not equilateral but scalene: the base is 93 mm. or 3 11/16 inches; the left side is 105 mm. or 4 2/16 inches and the right side measures 116 mm. or 4 9/16 inches. It is interesting to note that the left sigmoid notch measures 29 mm. and the right sigmoid notch measures 37 mm., making just about one-third of an inch

difference. Figure 8 is a front view of this skull and plainly shows the excessive development on the right side. Figure 9 is a view of the base of the cranium. Here again we find the development stronger on the right side than on the left and especially in the zygoma. Figure 10 illustrates the cranium from above. Measuring from the medial line we find the greatest left lateral width to be 63 mm. or 2 1/2 inches and the greatest right lateral width to be 80 mm. or 3 1/8 inches. The circumference of the skull is 19 3/4 inches, the right side being 10 1/4 inches and the left side 9 1/2 inches. After studying these measurements and illustrations carefully what more convincing arguments may we pre-

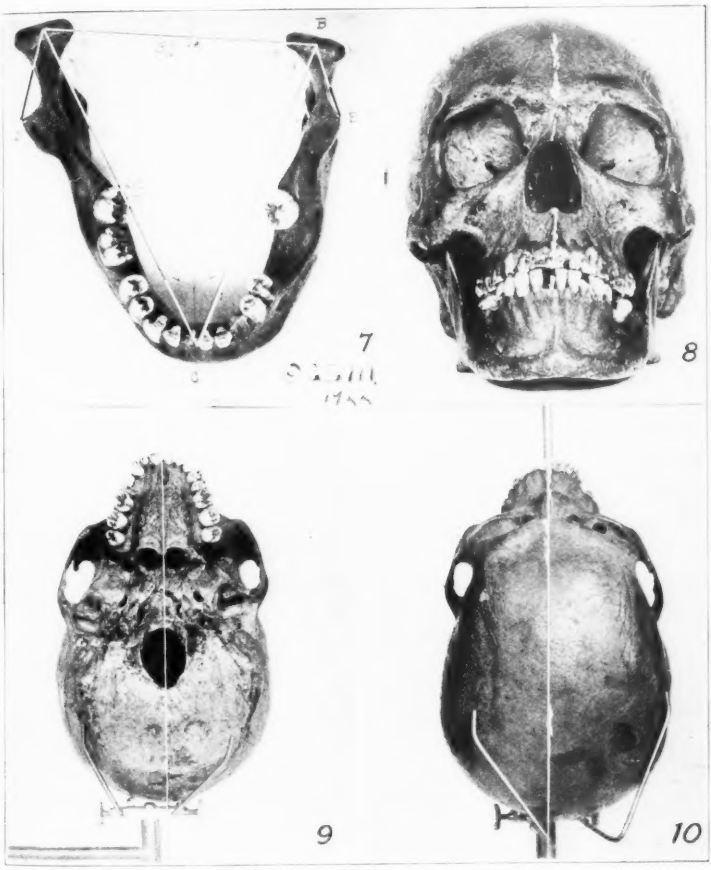


PLATE II.—ASYMMETRICAL SKULL.

Fig. 7, view of mandible from above; Fig. 8, front view (note excessive development on right side); Fig. 9, view of base of cranium; Fig. 10, view of cranium from above.

sent for proof of the statement, "Food and function equal force and form" (4)?

Allow me to again quote from Dr. Monson (4): "For the purpose of study it is necessary to obtain as perfect a skull as possible, one having a complete set of natural teeth. I advise a subject that has lived to the age of thirty or thirty-five years as one of this age would be more likely to have facets worn on all of the teeth denoting full function of mastication (Plate I). An individual having lost teeth on one side of his mandible would naturally have an excessive function on the opposite side, and in this manner, both muscular and osseous structures are excessively developed, throwing the mandible to one side (Plate II).

Keep in mind that in the ideal, the long axis of every tooth points to a common center, which is the center of the sphere upon which the occlusion is developed. The greatest crushing surface, the occlusion, is at right angles to the long axis of the teeth (4). It must follow that the total action of the muscles converges to this same common center. This group of muscles demonstrates the physical law that to every action there is an equal and opposite reaction. The radial point of this sphere must be the center of applied force as all of the teeth converge to it.

Plate III is from photographs of the mandible and maxillae of the ideal skull mounted upon the mandibulo-maxillary instrument. These are so mounted for the purpose of showing the conformity of the teeth and their supporting structures to the figure of a segment of a sphere. These and all other illustrations and drawings used in this paper were made under the direction of Dr. L. L. Eckman, of the Monson Research and Clinic Club, and have been copyrighted for the club and are here used for the first time.

Figure 11 shows the mounted mandible in perspective and its relation to the condyle cord. Figure 12 shows the general conformity of the spherical pyramid from periphery or occlusion to the vertex. Figure 13 illustrates the three-sided pyramid with the Bonwill triangle as the base. The angles of the Bonwill triangle are on the periphery of the sphere and are all equal. The angles at the vertex are in the center of the sphere and are equal to those of the Bonwill triangle. In Figure 14 note the general conformity of the bones forming the crushing base. Figure 15 is a segment of a sphere. Note the conformity of the cusps and condyles to the base of the spherical pyramid. Figure 16 shows a front view of a pyramid with the Bonwill triangle as its base. The dotted line is from condyle to condyle the same as in Figure 13 but taken at a different angle. In Figure 17 we see the long axis of the teeth touching at the common center. Figure 18 is similar to Figure 15 but with the superior maxillary bones or crushing base in proper relation to the mandible in centric occlusion. Note the general pitch of the teeth, from a side view, pointing to the center of the sphere. The large circle is in the medium line of the skull. The free end of the upper dotted curved line passes through the condyle head, consequently this point is two inches closer to you and hence appears higher on the sphere.

It is well to remember that the Bonwill triangle is not always an equilateral triangle of 4 inches. However, if the occlusion is developed upon an 8-inch sphere, whether the triangle be equilateral, or not, the sum of the three sides will be 12 inches. In other words, the sum of the three sides of the Bonwill triangle, whether it be equilateral, isosceles, or scalene, divided by three is equal to the radius of the sphere upon which the occlusion is developed. The great majority of cases will have a 4-inch radius although I have one patient with a radius of a trifle over 4¼ inches.

The technic of transferring the facial dimensions is very accurate and the check bites prove or disprove its correctness so that any mistake may be easily detected and corrected.

The foregoing principles of occlusion I have gleaned from Dr. Monson, either from his writings or from personal conversation. While they are more or less expressed in my own language and with my own illustrations the principles are entirely his.

It is doubtless true that faulty occlusion is more productive of diseases of the mouth and teeth than is any other one factor. There is a growing opinion that the members of the dental profession are more responsible for the prevalence of faulty occlusion in patients' mouths than

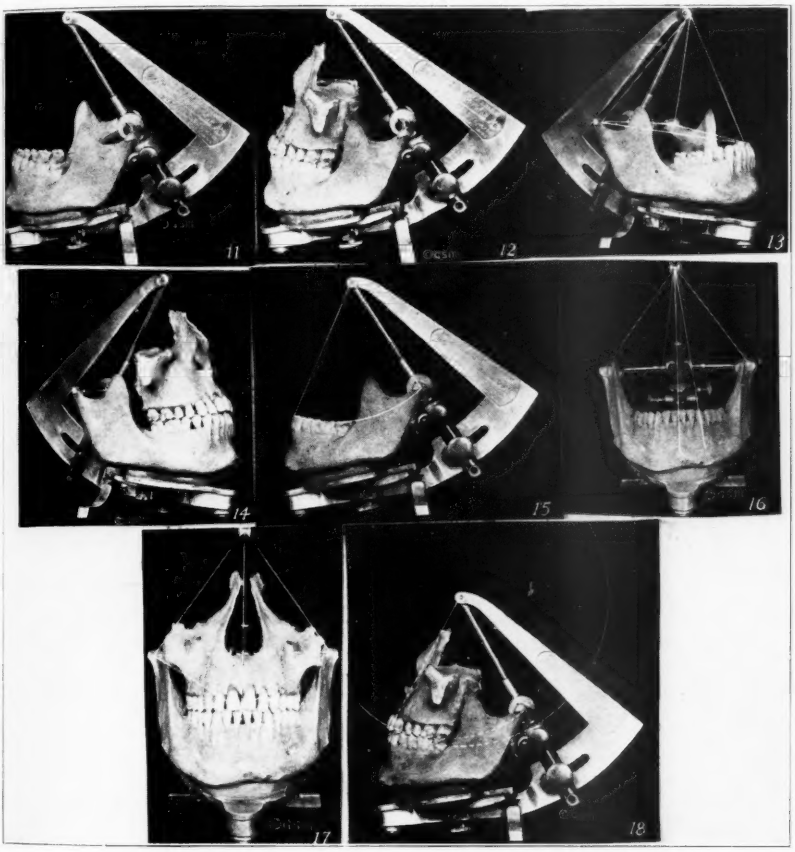


PLATE III.—MANDIBLE AND MAXILLA OF THE IDEAL SKULL MOUNTED UPON THE MANDIBULO-MAXILLARY INSTRUMENT.

Fig. 11, mounted mandible and its relation to condyle cord; Fig. 12, general conformity of spherical pyramid from periphery or occlusion to vertex; Fig. 13, three-sided pyramid with Bonwill triangle as base; Fig. 14, general conformity of bones forming crushing base; Fig. 15, a segment of a sphere; Fig. 16, front view of a pyramid with the Bonwill triangle as base; Fig. 17, long axis of teeth touching at common center; Fig. 18, similar to Fig. 15, but with superior maxillary bones or crushing base in proper relation to the mandible in centric occlusion.

is any other single cause. Link these two facts together and we see plainly that our profession has a very significant condition facing it. We may well ask the question, How long do we intend to trifle with this important problem of occlusion?

If we give this problem a fair degree of thought and study we must admit that, unintentionally, we have been wrecking many occlusions by our operations of a restorative nature. This may prove to be the case even in the restoration of a single cusp. We have also been allowing a great many faulty occlusions to escape our notice when it has been or should have been our duty to direct the attention of our patients to the condition. The difficulty has been a lack of knowledge rather than one of intentional neglect. It is our duty to make a careful study of the occlusion of every patient who presents for examination, just as much as it is our duty to examine the mouth carefully for dental periclasia. When the occlusion is found to be faulty we should direct our patient's attention to it and to the numerous disorders which may be attendant upon it just the same as we do when we find a condition of periclasia present. The patient has this service due him and it ought to be a criminal offense if we fail to inform our patients of these facts if we are aware of them.

It is a fact that each cusp has a definite relationship to each of the other cusps in both arches and to the masticating apparatus as a whole. This should make us pause and consider the necessity for checking up the occlusion before any restorative operation is initiated. We should also observe the proper methods of correcting and maintaining the occlusion during these operations so that a harmonious result may be obtained and a real benefit rendered our patients. When an operation involving even a part of an occlusal surface of a tooth is contemplated the operator should not only have a definite understanding of the basic principles of occlusion but he should incorporate those principles into the operation.

There is considerable confusion in the use of the term "occlusion," or in the way it is used. One would very naturally think that the term "normal occlusion" referred to a perfect occlusion. However the term "normal occlusion" is applied to the teeth when in centric occlusion. It must be remembered that teeth may be in normal occlusion when in centric position and that these same teeth, in function, may show considerable obstruction to functional range. In other words, a patient may have a so-called normal occlusion and still have a decided closure of the bite involving the loss of facial dimensions and also in function there may be a very decided case of traumatic occlusion owing to the fact that a cuspal interference exists.

Study Casts

It is becoming more apparent to many of us that study casts and mouth surveys should be made of all our cases as a preliminary step to the actual operation. We have an instrument now which will permit us to mount our casts in such a way that they will accurately reproduce every movement of the jaws from which these casts were made. With this advantage we are surely no longer in a position where we can afford to neglect this most important phase of dentistry. This procedure may seem slow and awkward at first but with practice in the technic the slowness disappears and the awkwardness develops into a definite skill which affords wonderful opportunities to study the functional relationship of the units of mastication. The fact that study casts, when properly obtained and correctly mounted, represent the position of each tooth when at rest as it is held or hangs in the arches when the mouth is open, places this technic in a class by itself.

It is claimed that even under normal conditions the teeth will depress into their sockets one-fiftieth of an inch under the force of mastication (1). They will shift

in their positions more readily under occlusion, either in centric position or in functional range, when trauma exists in the periodontium and especially if a loss of fixation obtains in any of the units (8). This very condition is one of the important factors which makes it impossible to diagnose the occlusion by clinical observation. The reverse condition is found with mounted casts for here we have a rigidity existing both in the plaster teeth and the instrument upon which they are mounted, permitting easy detection of cuspal interference to functional range. This not only assists in making the diagnosis of the occlusion more simple but allows of a more ready and accurate correction. In fact the whole scheme of mounted casts is vastly superior to that of clinical observation. It allows of a full outer view or a full lingual view at one time and permits of a better opportunity to study the occlusion as well as giving us very fine records of the case.

Various Cases

Let us review some of the cases which are frequently coming under the observation of the dentist. In the case of a patient seeking our services in the restoration of a single occlusal surface or a part of an occlusal surface, are we going to bear in mind the many details of a very fine operation with the exception of the most important? Are we going to complete this operation so that in centric position its occlusion appears perfect while in functional range it will cause trauma to the supporting structures or periodontium and eventually break these structures down or cause irreparable injury? This condition is well illustrated in a case from my own practice, where a very shallow mesio-occlusal filling had been placed in an upper second bicuspid. The case came to my notice about one year after the operation had been made. The operation was good in every detail except the main factor of occlusion. During that year the tooth had lengthened, owing to lack of occlusion, and when as it came into occlusion the wrong plane was established with the result that it came under Class 3 of force application (7) and a wedging process was instituted with the gliding of one plane past the other, forcing the tooth to one side of its socket. The radiograph disclosed a narrow rarefied area in the process between the roots of these approximating teeth, and also a slight thickening of the periodontal membrane. The tooth had lost its fixation to a very marked degree and it was only a matter of a few more months until it would have been necessary to remove it. This particular case is not uncommon but it is infrequently noticed. It not only limited the range of occlusion but had a marked tendency to lessen the functional activity of the mouth and particularly that important function of swallowing, for the tooth had developed, along with the definite loss of fixation, a considerable tenderness to occlusal pressure. This was aggravated both by the positive and negative pressures applied in the act of swallowing so that this function became of no importance as far as the drainage of the mouth and Eustachian tubes was concerned. After the occlusion had been corrected the patient was taught to swallow properly again and also instructed as to some of the purposes of that function. Without further instruction or care the soft tissues of this mouth have improved wonderfully. I may add that the looseness of this tooth was not altogether caused by the gliding of one inclined plane past another, but due to the lengthening of the tooth both the buccal and lingual cusps had become points of obstruction to either right or left lateral range.

In reconstruction work such as bridges and partial dentures the tendency to traumatic occlusion is even more marked, for the reason that more occlusal surfaces are being restored and there is, proportionately, more opportunity of faulty occlusion. It is interesting to make full

study casts of all mouths in which we find what might be termed excellent bridge-work, and then to properly mount these casts upon the instrument and study the occlusion. It will be found that in the majority of these cases, while they may be in normal occlusion in centric position, there will be prominent obstructions to occlusal range or a lack of occlusion altogether. There is usually more or less obstruction. These high points cause trauma to the supporting structures of the abutment teeth and in time the whole operation is a partial or complete failure. Is it any wonder that the fixed bridge has come in for so much adverse criticism and ridicule? The trouble is not that good strong abutments will not stand up under proper occlusion but that they will not stand up under the beatings of traumatic occlusion carried down to them from the bridge. Are we to continue this practice of making bridge-work, operations upon very small segments and without regard to functional activity, or are we going to perform operations on our patients taking into consideration the fact that a bridge is not made to fill a very small space in one arch but that it is to restore functional activity to the whole mouth and associated structures? Most of us have been guilty of focusing our attention upon the unit instead of the masticating apparatus as a whole.

Dr. Arthur P. Little (3) has very ably put the case in the following statement:

> We find that since the time of the early Egyptians we have been filling spaces in the dental arches with a total disregard for the fundamental principles which go to make up successful reconstruction work. If our reconstruction work is to reach a higher type of efficiency we must consider thoughts which are essential. As I look back upon my own partial denture work I can readily see that my greatest fault was that of narrow vision. The natural result was that I saw in every mutilated mouth an opportunity to make a denture. This was generally considered an end in itself. Instead of seeing the mouth as a whole, instead of realizing the importance of the correct anatomical relationship of the dental arches, instead of recognizing the physiological functions of the mouth I saw only an empty space which a partial denture could close. I had no idea of occlusion. In other words I saw only a small fraction of the situation; I could not recognize the more important possibilities that present themselves in reconstruction work.

Again, our patients seek full dentures. Are we going to maintain the old standard of opening the bite to the lip lines and arranging the teeth on this same faulty standard? Are we to arrange the occlusion upon unnatural planes and then proceed to the technical part of the operation in the most approved manner? It is doubtless true that the majority of full dentures close the patient's bite at least 3/8 of an inch. Many of the partial dentures have the same tendency but not to such a marked degree. It has been shown us that this closure of the bite leads to endless troubles for the patient (5), troubles such as faulty drainage of the mouth and of Eustachian tubes. Lessened muscular activity for the closure of the bite shortens the distance between the origin and insertion of these muscles and there is a consequent diminution in the tone of the muscles and in the muscle pull. Encroachment of the head of the condyle upon or into the external auditory meatus results in the majority of cases in partial deafness and in a few to complete loss of hearing. This condition also crowds the inside of the mouth. The tongue is crowded back and thereby impairs not only its own function but also the function of the adjacent parts. Many cases of throat trouble and nervousness and doubtless some forms of goiter are caused by the unnatural position these soft parts are forced to assume through closure of the bite.

Thirty-eight Cases of Defective Hearing

I wish to present some very valuable data with which Dr. Monson has furnished me. Thirty-eight cases of defective hearing were reviewed. Of these thirty-eight cases eighteen were using full dentures when presented. In all of these

the facial dimensions were short of normal and in 80 per cent they were very short. After new dentures were constructed there was an improvement in the hearing of each case. In some the improvement was marked and a few regained normal hearing. In every case the facial dimensions were restored to normal in the construction of the new dentures. Of the remaining twenty cases all had bridges or partial denture restorations of some kind. All were short on facial dimensions and all showed improvement in hearing after having had their teeth removed and full dentures substituted which restored or built up the face to its proper dimensions. The cause of these cases of defective hearing was the encroachment of the head to the condyle upon or into the external auditory meatus or a lessened potency of the Eustachian tubes due to crowding.

This is only a very small part of the data which has been gathered on this subject. I give this small portion merely to cite some specific cases so that the conditions may be more thoroughly brought to your attention.

Definite Working Plans

It is exceedingly odd that while we all recognize the masticating apparatus in its normal state as such a beautiful and well-balanced machine that we should not consider it as a whole when operating upon it and cease to do piecemeal work. An architect or an engineer always has a definite plan to follow in any construction work. They must know the part each unit is to play in respect to every other unit and to the whole. Why should not we, as dentists, follow this same course? Our properly mounted study casts, must, of necessity, be the working basis. Upon these casts we must plan our operations and upon these or similar casts we should complete our operations.

Conclusion

I cannot conclude this paper without again calling your attention to the fact that the big problem which is confronting our profession today is that of *occlusion.* It looks exceedingly large because of the fact that it has been so grossly neglected. What are we going to do? Our patients come to us for service. Are we going to sow destruction in their mouths? We cannot continue the old practice much longer. We cannot relegate it to the specialist for it enters into and is a basic principle of all of our operations. There never was a larger opportunity in the whole field of dentistry than that which the problem of occlusion is offering us today. It enters into and is dominant in every branch of reconstruction work. Is it too much to suggest that we study it and apply our knowledge to our everyday work? I believe we cannot do less.

Bibliography

1. Hartzell, Thomas B., and Henrici, Arthur T. "The Dental Path: Its Importance as an Avenue to Infection," *Surgery, Gynecology and Obstetrics,* January, 1916.

2. Kerner and Oliver. "*Natural History of Plants.*"

3. Little, Arthur P. "*Filling Spaces or Building for Efficiency.*" Read before West Central Minnesota District Dental Society, July, 1921.

4. Monson, George S. "Occlusion as Applied to Crown and Bridge-Work," *Jour. Nat. Dental Assoc.,* May, 1920.

5. Monson, George S. "Impaired Function as Result of Closed Bite," *Jour. Nat. Dental Assoc.,* October, 1921.

6. Schwendener, *Mechanical Theory of Leaf Arrangement,* Berlin, 1878.

7. Stillman, Paul R., "Traumatic Occlusion," *Jour. Nat. Dental Assoc.,* August, 1919.

8. Smith, Tom. "Traumatic Occlusion and Its Correction in the Treatment of Pyorrhea Alveolaris," *Jour. Nat. Dental Assoc.,* December, 1921.

CONSERVATISM IN BRIDGE-WORK

By FRED B. HART, D.D.S., San Francisco, California

(Read before the Chicago Dental Society, February 21, 1922)

THE problem confronting the dentist to determine the best means of supplying missing teeth has always carried many perplexities and responsibilities; but the past few years our literature has been so filled with conflicting opinions that the scrupulous and conscientious operator has often been influenced to the point of experiencing considerable difficulty to decide how best to serve his patient.

The fixed bridge has been the object of severe attack since Hunter in 1911 called attention to the menace to health resulting from the insanitary condition of mouths due to our much-boasted American dentistry, and the methods generally in vogue received a blow a short time afterward by Rosenow's indictment of the apical abscess.

The accusation made by Hunter aroused indignation and resentment at first, but it was closely followed by an awakening that structures which we had realized long before were not monuments to the most wholesome cleanliness, must, because of the general acceptance of the responsibility for systemic disorder, undergo a change.

Mention was made that Rosenow's charge affected all procedures then in vogue. We must not be unmindful that Dr. Peeso had long before recognized the desirability of eliminating unhygienic influence of the fixed bridge, and made bridges that permitted removal, but his procedure, which required the loss of the pulp, as well as those who favored the fixed bridge and advocated its removal was brought under the ban by the possibility of the pulpless tooth to abscess.

Much has been done in both the fixed and the removable bridge to overcome these objectionable features. We must credit the work of Dr. Tinker and others in putting the fixed bridge on a higher plane, and it is also to the credit of these men that they have been fair enough to acknowledge that the fixed bridge has limitations and to look with favor upon a removable structure, could one be supplied that would give lasting and satisfactory service.

Some of the supporters of the removable bridge have not been so liberal in their views, as they have deprecated in every particular the employment of the fixed bridge, and have mercilessly attacked the ideals of those who advocate its use, even criticizing colleges for continuing to teach it. Such drastic condemnation has been given much prominence in certain of our publications, and while some good may have come from it, it seems to me that the cause would be better served by a more lenient attitude.

Webster gives as a definition of a conservative, "One who respects old institutions; not subject to change simply for the sake of change." It is my desire to

qualify to that definition. I am going to submit some ideas that probably cannot be considered among the older methods, but I respect the old institutions and have not changed simply for the sake of change.

Although interested in the development of removable bridge-work, and with great confidence in the advisability of its use, I could not get pleasure in entirely condemning the fixed bridge, if for no other reason than that I meet among my friends every day someone who tells me of a bridge that gave pleasure and profit to the patient, and the belief that such cases demand a place as successes. We respect the opinions of many of the men who cite such cases; we credit their ability to observe, and esteem their truthfulness. I feel no greater affliction could be had than for one to become so obsessed with his own ideas as to stunt the appreciation for his fellow-worker, to disrespect his honesty of purpose, and to discredit his ideals.

As before mentioned, however, most zealous fixed bridge supporters admit the advantage of having a structure that can be removed for cleaning, and he may also acknowledge that many of the requirements of construction for the fixed bridge are undesirable. From the fact that most operators prefer when possible, to construct a bridge with one end given some freedom of movement, it is an acknowledgment that it is desirable not to tie two teeth rigidly together if it can be avoided. It is also considered, where two teeth are so tied together, that the abutment restorations must be very strongly made and must firmly grasp the tooth. To do this often means excessive cutting and the necessity of resorting to such restorations that impair and require much of the natural contour of the tooth to be restored.

The fact that the abutments must be placed in parallel relation when both ends of the bridge are fixed, together with the rigid holding of the teeth, limits the use of the inlay which would disturb the smallest amount of natural tooth contour when used as abutment restoration.

In cases of strongly converging or diverging teeth great difficulty is often experienced in bringing about the parallelism required by fixed structures without pulp devitalization. All these are factors to influence a conclusion that a large percentage of cases would be better cared for by a removable structure if we have one that does not offer objectionable features that would overbalance those attributed to the fixed type.

It is not surprising that in the endeavor to perfect or to originate ideas for the correcting of some fault, extravagant claims might result from the concentration of thought exerted over an extended period of time in that effort. Both the dental and the medical professions have been swayed by this influence. We can all recall an endless number of instances in which the profession has been so affected, and bridge-work has probably come in for more than its share in recent years. An example is given in the so-called movable-removable bridge. While it has been conceded by many thoughtful dentists that it is not best to rigidly tie healthy teeth together, and that it is desirable to have some yield permitted as the force of mastication is applied on the individual abutment tooth, or the artificial teeth supplied, very extravagant claims have been made and have had much influence.

It is believed that the latero-rotary movement of the movable-removable bridge which has received so much mention and has been credited with such beneficial effects upon the mucous membrane and all subjacent tissues, has been accomplished in many cases as a detriment to the attachment to the abutment teeth. A bridge that has been constructed

with attachments that are not placed in parallel relation to each other buccolingually cannot rock as described by the originator without exerting a leverage upon the abutments, yet the tendency to yield is increased because they can seldom occupy a position in line with the stress of occlusion.

It is claimed that the mucosa takes the stress, and that the attachment acts only as a guide which, if true, would still exert a leverage by its movements, but it is also asserted that a check is made by the attachment before the limit of elasticity of the mucosa is reached, and if that is so, damaging results may be expected when it occurs.

The most destructive factor we have to contend with in all our work is the force applied by the teeth in masticating. No bridge, fixed or removable, can be other than damaging if the occlusion is not properly centralized, and we consider that the removable bridge should certainly have its attachments placed in line with that stress. We feel that the first thing in constructing a bridge, even before the decision is made as to what type of structure is to be used, should be a careful study of the direction of the force as would be applied in mastication.

A large attachment, which must be placed in a tooth as it will best receive it and will not permit the adjustment necessary to compensate for this important factor, cannot safely be used. Many ideas of the so-called movable-removable bridge seems to be founded without sufficient regard for these mechanical principles. Consider the arching of attachments so they will more readily yield a rocking motion, spoken of as a rhythmic movement. To arch to a central position on an attachment will not help matters if that point is not in line with the stress as applied. It has been said that if the attachments are not arched they will arch themselves. If this is a fact the force of occlusion is responsible for it, and the farther that is applied from the central position on the attachment the greater is that influence, and we have a movement, the degree of which cannot be estimated, and wear is checked only as the force is spent.

Many other claims have been made that are not well founded upon safe mechanical principles. Some of these are being discontinued, which shows the indiscretion of so harshly criticizing the work of others.

The term "removable bridge" has been stretched to cover all replacements where some teeth are still remaining in the arch, when in reality perhaps all removable bridges should be considered partial dentures, or strictly speaking, are partial dentures. I wish, however, in referring to removable bridges, to be understood as considering them in positions that have formerly been looked upon as positions for fixed structures.

Many systems and means of attachment have been advanced, all of which have merit, and all, perhaps, have their limitations. The system that has been evolved and which I shall now submit to you may well be included in that class. No claim is made for it as being a panacea; in fact, it is felt that much injury often results from such extensive claims, as some are apt to try to use it where failure could be the only result. What the profession probably needs is a thorough understanding of the various systems, and then a greater development as engineers to know when and how to proceed.

The thought first suggesting the inception of this system was that it was not ideal to select a given attachment because it was manufactured to be used in a certain position. A smaller attachment was needed, and yet one that was strong and offered sufficient surface for frictional resistance against dislodgment. The thought of being able to place the

attachment in line with the stress of occlusion became paramount, and to that end a two-piece stud or male portion was evolved that would permit the combinations to be formed which would offer the advantages of placement in the tooth where it would best support, and also guard against disturbing the normal tooth contour or encroaching upon the pulp. Another consideration was that the best retentive form of cavity, if an inlay was to be used as an abutment restoration, was one that permitted parallel perpendicular walls with sufficient tooth structure remaining to insure strength. That the adaption might be made to fit the condition, further grinding or shaping of the stud may be done by the dentist, after which the socket is formed around it by an instrument devised for that purpose. Thus an attachment is made to meet the individual needs of the case.

That it is necessary to parallel the sockets so the bridge may be removed is realized, and to do so mandrels are usually made to fit the body of the sockets, but as the privilege has been afforded to make different combinations and to further shape attachments to suit the case, mandrels that would fit that portion of the socket would not be practicable. The slot in the socket which adapts to the stem of the stud is of unvarying width, and mandrels are made to accurately fit into it, which are held securely by means of a screw, the head of which projects over the slot and gauges the material.

A paralleling instrument of small and simple design is used to secure vertical parallelism.

To avoid the possibility of having the attachments stand in relation to each other that would not permit centralizing in line with the stress of occlusion, pins are inserted in the hubs of the mandrels and a side paralleling instrument is used which insures us that the stems of the stubs are in a parallel relation to each other. While the sockets are being soldered in their respective abutments, carbons which are shaped to fit the slot of the socket are used to hold them in position during this operation, and the construction of the bridge proceeds.

With these attachments the following accomplishments are attainable; the inlay can well be used for an abutment restoration which is no doubt the most ideal form we have today for that purpose; more accurate tooth form can be maintained; excessive cutting of the tooth, either of the periphery or toward the pulp, is unnecessary. Outline form and best retentive form of cavity can be accomplished. Greatest strength is afforded, as the attachment takes stress not only across the ends of the bucco-lingual portion of the stud but on the stem close to the bridge unit. The claim is not made that the mucous membrane can be asked to take more than a small amount of the stress applied in mastication. The great advantage claimed is the possibility for adapting in line with the stress of occlusion.

They are retained against removal by the sockets being adapted over each individual stud, and not only fitting around the body of it but tightly fitting on each side of the stem, while slight spreading of stud will compensate for wear.

Inasmuch as we are considering this subject from a conservative standpoint we feel justified in mentioning briefly the economic side of the bridge-work situation. Some have denounced the fixed bridge to the extent that they would deny its employment even if removable bridges were beyond the financial possibilities of the patient.

We are going ahead, but we should bear in mind that we must still look care-

fully on all sides to see that our theories and principles are such as will stand the test, and will assist in taking a place as a permanent and satisfactory service.

Discussion

M. G. Kral: Ever since removable bridge-work made its appearance considerable agitation has taken place in regard to its use. On the one hand were its supporters. On the other, those who ridiculed and condemned it. Fixed bridge-work seemed to have so many disadvantages and to be so inadequate in many cases that we decided to try a few experimental restorations of the removable kind. As these were rather extensive cases of long spans naturally we were skeptical as to the final outcome. But as these cases came before us for check-up examination from time to time and the conditions noted, we were amazed at the wonderful results. Consequently the experiments were extended, bridges of shorter spans constructed with equally gratifying results.

The essayist has given us his ideas of conservatism in bridge-work and by so doing continues to leave the burden of decision upon the individual operator whether a fixed or removable structure should be employed in the restoration of missing teeth. After observing hundreds of cases my question is, if a removable structure is advisable in certain specific cases, why not wherever any bridge is indicated? Must we go on giving those who place themselves in our care unscientific and unhygienic restorations?

Let us give credit to those who have fostered improvements along any lines of bridge-work, but on the other hand let us condemn the practices which have produced pathologic mouth conditions. I protest against the use of the gold shell crown, open face or slipper crown, the banded Richmond crown and any or all restorations which cannot be made to conform to the contour of tooth surfaces. What good can be derived by the removal of infected teeth if we replace them with artificial substitutes whose abutments produce lesions in the investing tissues equally dangerous to the health of the patient.

The scope of our responsibility to the patient has a very wide range. Our work has not been well done, providing nothing has been accomplished aside from the construction of the appliances. The mere employment of special attachments cannot insure the success of a case unless all of the countless details are worked out in their entirety.

Naturally our ideal is a finished piece of work which when placed in the mouth will please the patient both as to comfort and appearance. We must know that we have conserved the pulps of our abutment teeth inasmuch as we have employed a conservative plan of tooth preparation and that our patients can and do get the maximum amount of usefulness and service from their bridge-work.

Prior to planning our case we must take into consideration the conditions of the mouth:

1. Accurate models from plaster impressions of mouth for reference and laboratory study.

2. A full mouth radiograph of all teeth and supporting structures.

3. Removal of all abscessed or granulomatous teeth, those having lost considerable of the supporting alveolus and peridental membrane, and all broken off roots. Ample time should be given for the absorption of alveolar process before placing restorations of a removable nature.

4. Removal of all deposits of calculus. Corrections should be made on all teeth bearing imperfect fillings and crowns. Restore contacts and natural tooth contours. Nature provides tooth contours for the protection of the surrounding soft tissues; therefore every line curvature and prominence are there for a definite purpose. Whatever that may be it is our duty to know and to reproduce them.

5. Study the cusp interdigitation. Note and correct the high points in the lateral excursion of the mandible. We must bear in mind that this lateral movement takes place hundreds of times during each meal. The investing structures or tissues are not rigid, therefore any point or cusp of a tooth occluding before any great pressure has been exerted will in time loosen the tooth.

6. Visualize the finished work. Have a thorough knowledge of the method to be pursued, get a mental picture of the case as it should be finished and lay plans accordingly.

Inasmuch as I believe the best results are attainable only by the use of movable-removable bridge-work, carefully planned and constructed, a few suggestions at this point may not be out of place since practically every dental school has seen fit not to include this technic in the curriculum of the regular school work, making it necessary for the dentist to look about for other means of mastering this subject.

Perhaps the most logical method to pursue is by planning and actually constructing a number of dummy cases on a typodont, as it is hardly fair to experiment on practical cases until a fair amount of technic is gained. Having mastered that, select a simple practical case of a single missing tooth in the posterior of the mouth. As success and confidence is gained one may take on more complex and intricate cases.

Before we go farther let us consider removable bridge attachments. The consensus of opinion among modern bridge-workers is that

the bucco-lingual type of attachment is the most desirable.

An attachment must be of such size that will permit soldering into inlays without excessive extension of cavities or the over-contouring of inlay.

It must be interchangeable which calls for uniformity, precision and accuracy in its manufacture. I disagree with the essayist that this can be done by hand.

The design must be for frictional retention rather than wedging retention. An attachment must be so planned and constructed that it will permit of individual tooth movement.

The point brought out by the essayist for a lateral parallelism as well as the perpendicular is good.

CONSTRUCTION OF CASE

Select a simple bridge, one where the artificial substitute and the abutments are subjected to the same physical stress, that is, where the stress is in the same direction.

The G. V. Black rules of cavity preparation are carried out in all details.

Having cut cavities put matrix on tooth, soften wax to proper plasticity and force in one direction, hold in position until it stops yielding, remove to see that all points are reproduced, remove band and trim to anatomical form, finish all surfaces leaving occlusal to be finished last.

Approximately trim out a seating for the bucco-lingual jacket.

Remove, invest and cast. Use a hard gold alloy for casting. Place castings in cavities; test occlusion.

Reduce soft tissues with a one-thousandth per cent solution adrenalin chloride. The impression is then taken in plaster. It is best to remove impression and inlays intact where possible.

Inlays should be seated securely and abutment walled off carefully. Pour low fusing metal into this form. Allow metal to chill, remove moldine. Impression is varnished in the usual manner and artificial stone is packed into the remaining part of impression. Allow time for setting. Separate. Be certain that the inlay is perfectly seated in the cavity and that there is sufficient room for housing the bucco-lingual jacket in all directions. It is desirable to place attachments at a 5° angle mesially. Parallel attachments carefully and wax in position. Carbons anti-fluxed are placed in slots; cavo-surface also anti-fluxed. Invest in refractory compound. Boil out wax with stream of running water. Remove surplus investment, flux carefully and solder. Clean carefully in hydrochloric acid and place in cavities. Test for parallelism before trimming occlusion.

Adjust slots to accommodate male part as quite often in soldering the contraction of solder has caused an irregularity in the bucco-lingual jacket; sizing tools of proper dimensions are indicated for this step. Burs, files or sharp instruments must never be used within the bucco-lingual jacket.

Teeth of proper size and shade are selected. It is often necessary to correct or modify a shade or contour by the addition of porcelain. In specific cases entire teeth are built up much like jacket crowns.

Cut teeth to fit model before carving occlusal surface. Grooves are then cut on mesial and distal surfaces for trusses which are to receive the stem of male portion of attachment. Prepare teeth so there is an even distribution of wax thruout. This does more to insure satisfactory casting than all other precautions.

Conform two layers No. 28 gauge wax to model. Press out wax pattern over tooth, trim down to one thickness No. 28 gauge wax over portion to be attached to saddle, place in position, tack and contour with molten casting wax; trim to desired size, remove and cast.

In reference to castings, never use anything but the most reliable golds made especially for removable bridge-work.

After casting is made, examine for nodules, removing any if present. Attempt to seat tooth. If it binds do not force it. Remove each time it binds, relieve offending spot until tooth finally reaches position.

Trim and polish with tooth in position, always against tooth to prevent distortion of margins.

Cut slots in trusses with fissure burs and separating discs. Wax stem of attachment to truss. Remove and solder one at a time. Cut off excess stem. Reseat teeth and refinish. Bridge is then ready for trial in mouth, where final adjustments are to be made.

G. Walter Dittmar, Chicago, Illinois: I should like to call attention to one or two things in connection with the paper. The first is the method of making the stud to fit the cavity. In other words, he has a process by which he can reduce it to a size and form that will fit the particular cavity. If he has a tooth, the cavity of which is small, he can make a stud and then make the sleeve fit accurately over the stud which is to be inserted into the inlay. The little device for making these sleeves is wonderfully simple and accurate. The parallelometer devised is so simple and yet so accurate that I think it is worth while giving it special mention.

I still believe there is a decided field for fixed bridge-work, and that there always will be until we get to that particular position where we do not need bridges. I think the fixed bridge has its place. However, it is not intended for all cases, nor are removable bridges suitable for all cases.

Removable bridge-work from the standpoint

of being more sanitary has a decided advantage. If you can take a bridge out, scrub it, and put it back, it is cleaner than you could get it with a toothbrush, if fixed in the mouth. However, a fixed bridge placed where it is indicated can be kept as clean as the natural teeth if the patient is taught how and makes an effort. I do not think that many people are poisoned by the accumulation on their own fixed bridges. Individuals become immune to a cetrain extent. I do not wish to be understood as decrying the dangers to focal infection, or favoring filthy mouth conditions, but it is a well known fact that patients establish a certain amount of immunity to such conditions.

Dr. Hart is right in saying that "the more immovable a bridge is, the more efficient it will be for masticating purposes." The more movable it is, the more it gives, and consequently will not enable one to masticate the food as thoroughly. From that standpoint, a fixed bridge is better than most removable ones.

The criticism was made that this movable-removable system was not being taught in our dental schools. The method is too complicated to teach in dental schools. I believe the reason the average prosthetic teacher is not teaching this particular system is because he is not as yet convinced that it is fundamentally right. The method is too young. The fact that it is ten or fifteen years old does not mean very much. The fact that some of these removable bridges have been successful for four or five years or even ten years does not mean much. I have seen fixed bridges that have been worn for twenty and thirty years and are still doing excellent service. After this process has been in use by the profession for thirty years or more, we can then look back and see whether it is successful or not.

Hart J. Goslee, Chicago, Illinois: This subject of "removable" bridge-work versus "fixed" bridge-work, as it is being presented to the thinking members of the profession today, causes some of us to pause and study the statements that are being made by the advocates of these respective methods.

The only value of any method lies mainly in its range of application. And I question very seriously whether the range of application of that particular type of removable bridge-work, which is being advocated by the essayist is not very much more limited than they would have us think.

There is a range of application for all of the various types of attachments for removable bridge-work, and there is a very great range of application and usefulness for all forms of removable fixtures, and yet it is my honest and candid conviction that there is also a great range of application and of usefulness for *fixed* structures. One method is indicated in one place, and another in another place, and in proportion as the bridge by which you supply missing teeth is movable, in that same proportion is its efficiency for masticatory purposes minimized or reduced; just in proportion as you make your structure fixed, in that same proportion is its efficiency for masticatory purposes increased. However, I would not have you think from what I have just said that every dental bridge should be a fixed bridge.

All of us have learned a very great and most important lesson and that is that we erred greatly in the past by making too many large structures of a "fixed type." But there is and I think always will be many places for a fixed bridge, where but two or three teeth of similar functional activity are involved. The increased efficiency which can obtain by supplying missing teeth in a fixed manner, will always warrant us, in my judgment, wherever the conditions are favorable, to give preference even to "fixed" bridges, providing that we will always remember that sanitation is one of the requirements which must never be overlooked.

It is a somewhat singular thing that these removable bridge attachments are shown only as applied to small structures, involving but two attachments and two missing teeth, the very best place for a fixed bridge.

Dr. Ottolengui, who is a disciple of Dr. Chayes, has been discussing the question of movable and removable bridge-work for many years, but we do not agree. In my office once he removed from his lower jaw a beautiful piece of workmanship which involved the right first molar in a removable bridge and said, "That is the only way missing teeth should ever be supplied." The workmanship was beautiful, but I do not know how anyone ever got those two inlays in without devitalizing the pulps. That bridge was not any more sanitary than a fixed bridge would have been. I advised him to cut off that saddle, and cut down the approximal sides of that dummy, and cement it in, and that he would have a more useful structure.

Almost all of these removable bridges where that type of attachment is used are simple, small fixtures. They did not show us bilateral structures involving both sides of the arch and some of the anterior teeth. Those are the cases where removable bridges are indicated, and where you have to use them. It is not a question of whether you want to or not or whether you believe in them or not. Where we are to supply missing teeth on both sides of the arch, with the possibility also of missing anterior teeth, one or more, we must have a removable structure, and a single structure in those cases is better than several small ones. I never make a fixed bridge of more than three or four teeth, and I prophesy that we shall always do fixed bridge-work to that extent.

When a bridge is larger than that, then a removable one is demanded.

I do not believe very much in the theory of the massaging of the soft tissues by the saddles in removable bridge-work. Certainly, the soft tissues of the mouth will yield more readily to pressure than will the supporting teeth, but the soft tissues cannot yield until the supporting teeth likewise yield and therefore any possible advantage in the way of the massaging of these tissues by the slight mobility of the fixture is *nil*. However, we do not have the same degree of stasis of capillary circulation because there is no definite pressure at one localized point all the time; therefore, the circulation in these tissues will remain more normal than if the structure was absolutely immovable and perhaps slightly imbedded, and to that extent we would have a more normal condition. But the condition is not made more normal by the slight mobility of the fixture. It is more normal because there is no pressure to interfere with capillary circulation.

In conclusion, I wish to say that there is a place for this type of attachment, and the suggestions offered by Dr. Hart will enable us to obtain the advantages to which I have referred. But I have found that all methods requiring the same degree of exactness are beyond the possibility of the average dentist, either for reasons of money, of time, or of ability, and therefore these methods will always to a greater or less extent be laboratory methods. The average dentist cannot or will not do it, and therefore the work will be delegated to the dental laboratory, and it is to the dental laboratory man of high skill and experience that we will have to look for the successful application of these various methods. There are more simple methods which we can use successfully, because we can do more injury to good sound teeth by utilizing a method which we cannot apply with skill than we will do to good sound teeth by using any method, however simple, that we may be able to skilfully master.

Nathan M. Kaplan, Chicago, Illinois: Dr. Hart has given us a useful system and a new idea. In making these boxes so close to the attachment, using a stud as a guide, if the box is soldered to the inlay, the box will be so tight that it will be impossible to insert the stud and take it out with ease. Dr. Hart claims that the box must be trimmed and made to fit. These types of attachment must fit the box in its entirety, not at one point like a wedge, depending on personal contact. I can see no difference in preparing the cavity and making the attachments to fit the cavity, or in manufacturing the attachments so small that it can be made useful and applicable in all cases. I believe this system is necessary on account of the fact that most of the attachments on the market are too large, and that smaller attachments are required for this type of work. I want to bring out the point that by manufacturing the attachment in accordance with our own ideas we get a far better attachment than by pursuing this particular method.

Dr. Hart (closing): The advantage of removable bridges is that they can be taken out, cleaned, and put back again. Patients have every opportunity for removing these bridges and of keeping them clean.

In taking a conservative attitude in regard to bridge-work, I feel that fixed bridge-work can be successfully used and it has its place. On the other hand, there are many conditions in which small removable bridges are indicated. In other cases larger removable bridges can be used successfully.

It has been stated in the discussion that the average dentist cannot put in removable bridge-work skilfully and successfully. I have been talking along lines that the average dentist can aspire to. We want the average dentist to raise the standard and to do the very best that can be done in dentistry. I cannot see how dentistry is going to make much progress if we are going to make the standard fit the lower grade of men, considering the average is as low as was stated in the discussion.

RESEARCH REPORT FOR THE MICHIGAN STATE DENTAL SOCIETY

By U. G. RICKERT, M.S., D.D.S., Ann Arbor, Michigan

(Read before the Michigan State Dental Society, Ann Arbor, Michigan, April 4-7, 1922)

WHEN the state society turned a fund for dental research into the treasury of the University of Michigan and its committee appointed C. J. Lyons and myself to direct the work, we decided to select a subject for study that had a direct bearing on some one of the immediate problems confronting the practicing dentist. In view of the large number of patients referred to us suffering with one or another form of low-grade infection, we were led to believe that if we could in some way assist in making correct diagnosis, the undertaking would be worth while. This has been the main object of our work during the past two years.

When we began this study there were those who insisted that all pulpless teeth soon became infected. With open minds we first cultured a large number of such teeth to determine the correctness of this opinion. A bacteriological study to date of approximately five-hundred pulpless teeth, cultured by the most painstaking method, proved to us that the radical statement that all such teeth are infected, was far from the truth and should have been challenged much sooner. It is true, however, that while the infected teeth of patients suffering with some form of low-grade infection was found to be two and one-half times that of those giving no such histories, the percentage of the latter was higher than we had hoped to find. This fact led to the second inquiry, how serious are such teeth when found in either type of above-mentioned patients, for there are those with the other extreme view who believe that the bacteria at apices of teeth are to be regarded with but little more concern than those of the saliva of the same patient. The second proposition concerning the seriousness of such teeth is the more difficult to prove. While our clinical and experimental observations lead us to believe that secondary diseases are less often initiated by the teeth than some workers would have us think, yet we nor anyone else, so far as we know, have any concrete evidence as to just how often they do initiate secondary foci.

This led to the third inquiry. Can infected teeth be treated and retained with safety to the patient? Our work would indicate that if such safety depended on bacterial infection alone, the average patient need have little fear of properly treated teeth. For contrary to all that has been said and written about the impossibility of sterilizing dentin, we are amazed at the ease with which root canals can be made aseptic. Our earlier method of taking cultures of dressings from root canals was defective and we too held for a time, that the sterilizing of an infected root canal approached the impossible. That they may be made aseptic temporarily is easy of demonstration, but that a large percentage of treated canals will remain aseptic indefinitely, in all types of patients, is more difficult to prove. As an experiment, paper root-canal points

saturated with bouillon were placed into canals that had been previously treated with chloramin. These were removed and cultured some weeks later and were still found aseptic. This experiment was intended to attract organisms from the dentinal tubules if any escaped destruction during treatment. If the precautions outlined in our last year's report for culturing dressings are carefully carried out, anyone familiar with bacteriological technic may duplicate this experiment. This is the most severe test we could conceive for testing the possibility of sterilizing dentin. We were successful in sterilizing infected canals with reduced silver for a number of years, but have only succeeded in accomplishing the same thing with chloramin and certain members of the dyes during the past eighteen months.

In summarizing the results of our studies of the three-above mentioned inquiries, we are certain that sufficient work has been done in our laboratories to make the following statement: the assertion that all pulpless teeth become infected in a few months after pulp removal is one of the most vicious falsehoods recently published in the name of science.

As to the second part of the proposition, how often infected teeth are the primary foci, no such sweeping statement can be made, for admitting that there is substantial clinical evidence that the teeth may and do influence general health, we can conceive of no clinical nor experimental method of proving how often they are the initiating factors. We are compelled to admit partial defeat in this part of our study.

As to the third question, can root canals once infected, be made and maintained aseptic, we have been successful in answering this in part. We are quite positive in our statement that they can. We have convincing evidence that treated teeth may remain aseptic for many years. We cultured a few cases that were found aseptic at the apices many years after treatment. We confess, however, that if asked how often this may be accomplished with present methods of treatment, the answer would still remain more or less of an open question. Years of the most painstaking observations will be required before definite statements can be made as to maintaining aseptic canals due to variations of filling technic. The rather obscure factors of clinical evidence and the apparent variation of laboratory findings at once eliminates any positive statement or opinion based on the biased support of the literature. Both extreme views are ably supported in our journals. Therefore all contributions, no matter how logically written, are of questionable value unless supported by the sound clinical and experimental observations of the author.

The foregoing synopsis of past studies introduced the foundation for this year's work. The beginning of the year still found us in the same frame of mind as to the importance of more exact methods of diagnosis. For example, patients were referred to us by both physicians and dentists, presenting one or more pulpless teeth of strategical importance. The radiographic evidence was favorable, yet the patient was suffering with some form of low-grade infection of the type, that in the absence of other evidence, placed the teeth under suspicion. It occurred to us that the funds might be used to establish a sort of clearing house, where any member of the society might refer patients who insisted on availing themselves of every possible means of diagnosis, instead of depending wholly on radiograms and pure guesswork as has too often been the case. In last year's report we outlined a method of taking cultures without the removal of the tooth, so that the referring dentist could in several days have some information regarding the teeth in question. This year we hoped to approach the positive still more closely. Let us take for example a referred patient, and suppose that in the laboratory we find one or more important

teeth infected. Knowing that such teeth may be made aseptic temporarily at least, there is reason to believe that many operators under pressure on the part of the patient, would still be undecided as to the proper course of procedure. It now occurred to us that if the active organisms of apical infections have the localizing capacity attributed to them by Dr. Rosenow we might go still further and demonstrate in a few days that such teeth were not only infected, but that the invading organisms had localizing powers in that the identical organ involved in the patient, becomes the locus of infection in the inoculated laboratory animal. In this way we hoped in a large percentage of cases to remove much of guesswork as to the right procedure. Dr. Rosenow's records claimed localization averaging approximately 80 per cent of the cases, including principally gastric ulcers, joint and cardiac lesions, and a certain type of nephritis. We had also found repeatedly the green-producing streptococcus (viridans) the organism usually concerned in Dr. Rosenow's writings. Now we were not ignorant of the fact that many of the most capable bacteriologists in the country were unable to get the high percentage of localizations found by Dr. Rosenow, but there was an element of reason in his proposition and an element of confidence in the ability of Rosenow that led us to accept the latter notwithstanding the general failure of other competent workers to substantiate his work on localizations. It was worth trying, for if found correct in the large percentage of cases claimed for it, nothing since the advent of the X-ray could approach it for diagnostic purposes. We too were successful in getting lesions of important organs but the specific localizations in no way compared in numbers with those of Rosenow's. We have his methods and have conscientiously tried to duplicate his results and have been, we regret, unsuccessful. The only explanation we have to offer is that either we lack in technical ability or that there is a decided difference in the domestic requirements of the streptococcus of Michigan and the streptococcus of Minnesota. We desire to be clearly understood. We are in no way trying to discredit the efforts of Dr. Rosenow. The time has long passed when the contemporary worker who can pour out the most destructive criticisms on the workers in the same field deserves consideration as a capable contributor of science. We have stated our findings radically opposed to those of Dr. Rosenow in respect to specificity, but not unlike his in other lines of study. We hope that Dr. Rosenow will in the very near future demonstrate to us and to others, who have failed to duplicate his work, that he is right and explain wherein we fail.

Having failed to close the damaging evidence of a certain number of infected teeth by demonstrating a large percentage of localization, after spending a great deal of time in the attempt, we were compelled to approach the subject from another angle. A great deal has recently been said about the necessity of bacteriological control in the treatment of pulpless teeth. It is evident that the practicing dentist as a rule has neither the facilities nor the necessary bacteriological technic to successfully carry out this kind of work. It occurred to us that it might be possible to so simplify the technic that anyone desiring to check up his ability of treating infected teeth from a bacteriological standpoint might do so. It would be of some advantage for the operator, as must be observed, to know whether he has the ability to remove dressings successfully without contaminations. Then too it would also answer the question of approximately how often dressings with a certain treatment must be changed before such dressings may be removed and found aseptic. For example, as a rule the first two or three dressings charged with a mild antiseptic and left in an infected canal for a day will be found septic. That is, the antiseptic dressing in the presence of a pu-

trescent material will lose its potency and itself become septic. We are not insisting that all treatments must be accompanied with bacteriologic control, but we do believe that much available information might be obtained by the operator if he had some means of knowing about how often and how long teeth should be treated before the permanent filling can safely be inserted. This need not be made a part of regular routine, but enough could be done to acquaint the operator, to a certain degree at least, with important phases of the work that can be learned in no other way. For the most important information is available without the use of a microscope. Anyone can distinguish between a positive and a negative culture from the appearance of the culture media. The thing that concerns the dental operator most is whether the culture is sterile or infected. It is of little importance to him whether it is staphylococcus or streptococcus. If infected, there is just one or two things possible; either the operator has failed in his technic, in introducing or withdrawing the treatment, or the canal is still infected and not ready for permanent filling. In either case, further treatment would be indicated. It is our opinion that anyone unable to successfully check up his own work in this simplified way, with negative bacteriological results is justified in refusing to treat infected or pulpless teeth. All the equipment necessary is an incubator which may be improvised easily with no more materials than a plain box, an electric light and a thermometer. The box has a shelf and the light placed beneath the shelf at a distance close enough to maintain a temperature on the shelf of about 35° to 37° C. Thus far we have furnished the media to any member of the society on request. This was paid for out of the research fund. The method of removing and placing the root-canal dressing has been described.[1]

[1]*Jour. Nat. Dental Assoc.* April (1922), p. 302.

We have spent considerable time during the past two months in a laboratory study of several problems presented to us by the root-canal section of the state society through its chairman, Dr. Girardot. It appears that this section has reviewed and carefully studied the strong points of known methods with a view of developing a kind of Liberty motor combination technic of the best known and tried measures upon which all could agree. To our knowledge, no more thorough study of all angles of the problem has ever been undertaken. Every effort has been made to build on a sound foundation. The section among its several inquiries brought up the question of sterilization. This was delegated to us for further study. Inasmuch as the method for sterilizing the root-canal instruments by their technic called for alcohol and because a great deal has been said for and against the efficiency of alcohol for such purposes, we considered it worthy of careful study. We wanted to know what concentrations were best suited for the purpose and how long a time was required to destroy all staphylococcus and streptococcus and finally how long it took at the several concentrations to produce complete sterility. The teeth selected for the tests were freshly extracted roots known to be infected. The instruments were worked up and down in the canal just as they would have been in actual practice. They were then carefully wiped on sterile gauze and introduced into the alcohol for varying lengths of time. Many series were studied of each concentration so that our trials are not based on careless opinion, arrived at by a single attempt. There were slight discrepencies as one would expect for the different series were studied on different days necessitating different freshly extracted teeth.

Seventy per cent alcohol was the most efficient. The time required at that concentration was from four to ten minutes for cocci and ten to fifteen minutes for complete sterility. We are now experi-

menting with solutions that give promise of sterilizing, without damaging the instruments, in much less time than even the 70 per cent alcohol.

A second question of concern to the section was that of finding if septic root-canal instruments introduced into a jar of alcohol containing sterile instruments could infect through the alcohol? In other words, will infected instruments contaminate sterile ones in the same alcohol? In no case did this occur if the excess debris was wiped off before introduction into the common sterilizer.

A third question put up to us, was intended to demonstrate the value of formalin for maintaining sterility of closed cabinets. This is of interest to many, for most offices have one or more such cabinets conspicuously labeled "sterilizer". Thirty-seven per cent formalin was used. This was placed in a small open container and pellets of cotton contaminated by rolling between thumb and finger. The cotton to be tested was placed in close proximity to the formalin, within one inch of the open jar, and the cabinet closed. One of these pellets was cultured each day for seven days and all were found septic. The criticism that has been made of this experiment was that it was not claimed to sterilize but to maintain sterility of sterilized instruments, but to a bacteriologist, an agent that could not sterilize in seven days, instruments contaminated as described above, is of questionable merit for even maintaining sterility. We can keep sterile cotton pellets in this closed container for weeks with the same results if no formalin is present. That is, the original sterility is the important factor. Our experience proved to us that unless there is an abundance of moisture in the enveloping atmosphere and more free formalin than is given off from an ordinary container, the sterilization efficiency is negligible. Certainly no reliance for this means of sterilization is permissible. If the instruments are boiled previous to placing them into the cabinet, there is no harm in using the formalin, provided the original sterilization is complete.

In conclusion, we again wish to call attention to the statement in our introductory remarks that we have tried to be of assistance in solving some of the immediate problems confronting the practicing dentist. We frankly confess that we have not been successful in satisfactorily answering some of the more obscure phases of focal infection. On the other hand, we are certain that there is in this report, considerable information of fundamental importance in the management of pulpless teeth. We have not given up as hopeless, the unsolved phases involved in our study of the status of infected teeth, but we are carrying on this study in conjunction with investigations more certain of solution.

For example, a line of work under study at this time is an attempt at checking up the efficiency of various kinds of culture medias by making direct examinations of materials with the dark field illumination. We have spent a great deal of time adjusting our medias, to best meet the needs of our problem. The dark field illumination is the best answer we have at present for those who question cultural methods for determining dental infections.

In our last year's report, Dr. Lyons called attention to the possibilities of the analin dyes in dentistry. Other writers have since made strong claims for their use. We have already turned our attention to an experimental and clinical study of the most important members of this class of drugs. Not enough has as yet been done to make any statements, but we hope at a later date to have something to say concerning what appears at the present time to be the latest panacea of dentistry.

A LECTURE FOLLOWING STANDARDIZED OUTLINE OF THE ORAL HYGIENE COMMITTEE OF GREATER NEW YORK

By ARTHUR M. HUNTER, D.D.S., New York City

(Read before the National Dental Association, Milwaukee, Wisconsin, August 15-19, 1921)

IT IS always a good plan to interrupt one's work at stated intervals, in order to take inventory and to analyze processes to see where one's work will lead. Both medicine and dentistry took inventories not a long time back, and learned that they were treating effects and not causes. Immediately when the attention of these professions was gained, the tide began to turn, and as a result, today we are learning and practicing preventive medicine and dentistry.

Ten years ago a physician was apt to look at your tongue, take your pulse, prescribe a cathartic and then come back the next day to see how you stood it. Today it is different. He now tries to find out at once all of your symptoms. He examines your chest, your heart, your skin and your urine. He takes histories and files this information for further use.

Your dentist of ten years ago, was satisfied to fill teeth, make bridges and gold crowns or to move irregular teeth, but no longer is this true, for he also is practicing prevention. He takes case histories, he wants to know about your skin, your ears, your eyes, your heart, your kidneys and your chest. Particularly is he interested in the rheumatic group of ailments; rheumatism, neuritis, arthritis, neuralgia, headaches, and growing pains. If you want to make an interesting experiment ask your acquaintances if they remember having growing pains and see how many, no matter how old the person is, will answer yes at once and often they will describe the pains in detail, which knee or shoulder gave them the trouble, and often they can limit the activity accurately between certain definite years. Having learned which ones had the growing pains, ask about rheumatism and neuritis and you will learn that a large portion have suffered later in life, if there has been an infection in or around the teeth, the tonsils or intestines.

Probably the greatest stimulus for the inventory of the dental profession, was given by Hunter, a British surgeon. He claimed that American dentistry was septic dentistry and that the American dentists were killing large numbers of their patients. Naturally the profession was up in arms at once. Dentistry started to prove that Hunter was wrong. Then the awakening came that we were treating effects and not causes. We began to study harder than ever, to learn first the normal conditions and then abnormal ones, in order to find the causes of dental disease, and we are learning that one of the most important parts in our problem of prevention is the education of the public, for prevention is based on hygiene and hygiene is based on knowledge. Therefore I want to tell you something about your teeth, the processes which destroy them, the systemic disturbances which may be caused by diseased areas about teeth and primarily to tell you how you can prevent dental disease.

Teeth in the human are divided into four classes: incisors, those in the front of the mouth which are used for cutting; cuspids, those at the corners of the mouth for tearing; bicuspids, those just back of the cuspids for dividing the food into small portions; molars, for grinding.

The human has two sets of teeth, the baby or deciduous set consisting of twenty in number, and the permanent set of thirty-two. The baby teeth begin to erupt at about the fifth month after birth, the lower teeth usually coming first. They arrive in this order: the lower incisors first, then the upper followed by the first molar, then the cuspid and then the second molars so that by the time baby is three years old it has all of its first teeth. The first sign of teeth in the embryo occurs in the seventh month before birth. The germs of both the temporary and permanent teeth are formed in a flask-like depression.

The development of the permanent teeth is divided into two groups, those that replace the temporary teeth, and those that are superadded. The germs of those that replace the temporary teeth are started in the same sac that hold the temporary teeth. Those that are superadded, namely the first, second and third molars, are formed by a budding off of the permanent tooth directly in front of it. The first molars occur during the seventh month before birth, second molar fourth month after birth, and third molar the third year after birth.

The most important tooth in the mouth is the sixth-year molar. This is the first permanent tooth to erupt and is the first permanent tooth to be made. It starts to grow five months before birth and the crown is fully formed at birth. If this tooth is not in its proper place the others cannot be. This tooth erupts during the sixth year and crowds its way between the last baby tooth and the jaw bone, causing a forward development of both upper and lower jaws. If one or more baby teeth are lost or if the approximating surface of the teeth are decayed just so much development is lost and the permanent teeth will be crowded, as the jaws will not be large enough for the permanent teeth. Crowded teeth in narrowed jaws mean restricted breathing and probably nasal obstruction with its attendant ills and a mouth that is difficult to keep in a hygienic condition, which in its turn means more cavities and inflamed gums.

The question of the crowded arch and irregular arrangement of the temporary teeth is largely decided by habit next to the nutritional influence. If the child is given food which it has to chew, thereby supplying exercise to teeth, muscles and jaws, the teeth will come in naturally if no habit interferes. Thumb sucking, use of pacifier, mouth breathing, tongue and lip sucking, protusion of the tongue, etc., are sure to displace the normal arrangement. Proximal cavities and premature extractions of temporary teeth causing lack of development of jaws is a most frequent cause of a crowded permanent set.

The enamel which covers the teeth is the hardest tissue in the animal kingdom, and is only open to destruction by wear, chemical action and accident. It covers the dentin which makes up the body of the teeth, and which contains the blood and nerve supply. Even the smallest cavity affects the pulp, and although the pulp has the power to throw down a secondary protection, if the process of decay is allowed to continue, death of the pulp is sure to result with formation of dental abscess.

Dental decay is the most prevalent disease the world has ever known. There are not enough dentists in the United States to care for the needs of the school children alone, therefore the energies of the profession are pointed for prevention and detection of the cavities when they are small.

The First and Second Dental Societies of New York passed the following resolution: "Resolved: that the filling of

initial cavities is a moral duty to our patient, and an obligation of our profession."

Dental decay is caused by lactic acid forming bacteria which are allowed to remain in contact with the enamel of the teeth. These bacteria throw out a gelatinous plaque with which they cover themselves in order that they may work undisturbed. By this lactic acid they dissolve the cementing substance between the enamel rods, and so clear the way for attack on dentin. If this process continues the dentin is destroyed and the dental pulp becomes infected. After the pulp has become infected the bacteria begin their attack on the bone which holds the tooth in place, and nature tries to wall in this infection, and often a sac is formed. This is called a granuloma. A tooth normally moves in its socket one-sixty-fourth of an inch, and the force of mastication, about 350 pounds to square inch, is brought to bear upon it. This force on the tooth with the tooth acting as a piston will bring tremendous pressure on the abscess sac at the end of a root and will force it into the tissues pus and bacteria that are in the sac. These foreign substances are taken up by the blood which attempts to neutralize this material, but the constant supply will finally overwhelm the neutralizing agents, if the patient's resistance is lowered by some other agent, and sometimes I think that dental infection alone will lower resistance to such an extent that disease is possible. I know of several cases of disease that were cured by the removal of one infected tooth. I know of cases that were cured by the removal of several diseased teeth after medication had failed, and I know of several persons that are carrying teeth with large areas of diseased tissue and seem to be perfectly healthful, but these people will come to us sooner or later.

I remember while a student in college they told us in our study of bacteriology that someone wanted to inoculate a pigeon with pneumonia germs. The germs were injected several times but the pigeon remained well, with no evidence of disease. Finally the bird was forced to stand in ice water for twelve hours and was then injected. The germs immediately produced the disease and the bird died. The germs were the same, the pigeon was the same, but conditions had changed, the resistance had been lowered.

There is another channel thru which the usefulness of our teeth can be destroyed and by which a focus for systemic disturbances can be maintained; namely, inflamed gums. Each tooth has its own retentive apparatus, consisting of the bone, pericementum, the membrane lining the tooth socket, the cementum covering the tooth root and interdental fibers imbedded in the gum tissue. The gum tissue you will notice is not attached to the tooth at the free margin. This tissue has a marked elasticity in its normal state, but when it is chronically irritated it becomes soft and flabby allowing deposits to be made on the tooth root. This chronic irritation, may come from overhanging margins of filling, faulty toothbrushing, overwork or accumulation of decomposing foods. The deposit on the root in turn acts as a further irritant causing more inflammation and more loss of elasticity. The chronic irritation finally breaks down the resistance of the soft tissue cells and pus is formed. If these causes of infection are not corrected, the process proceeds until the retentive apparatus is destroyed and the tooth is lost. Meanwhile there is a surface which is a port of entry into the body for bacteria and their poisons. The bacteria we always have in the mouth and normally we have adequate defense against them, but when the tissue is broken and remains inflamed, the barrier is broken down.

A study of dental impairments in relation to the systemic conditions found was carried out by the Statistical Bureau of the Metropolitan Life Insurance Company. The following table is a brief summary of the principal findings. Com-

parison is made in this table, first, of cases not radiographed because routine examination did not reveal any devital or crowned teeth, second, of those which were radiographed because of the presence of such defective teeth, and third of those radiographed cases which showed the presence of blind abscesses:

METROPOLITAN LIFE INSURANCE COMPANY DENTAL CLINIC PERCENTAGE OF CASES SHOWING SPECIFIED DISEASE OR CONDITION

Disease or Condition	Not Radiographed Cases	Radiographed Cases	
		Showing Infection	Showing Blind Abscess
Neuralgia and neuritis	3.8	4.2	2.10
Headache	1.9	2.9	8.3
Nervousness	1.7	3.7	4.5
Colds and nasal fossae	19.8	23.1	23.6
Furuncles	2.4	3.8	4.5
Abscess and skin trouble	2.6	4.0	4.5
Albuminuria	0.9	1.1	3.3

One thing necessary to maintain a perfect article is to start with a perfect specimen. To insure sound teeth for a child, one must consider the diet of the expectant mother. Her diet must contain foods with sufficient lime to produce sound bone and teeth. The diet of the baby must supply this material as well as vitamines necessary to give the proper assimilation of the bone building material. After the teeth erupt, the child must be given foods that need chewing, in order to give proper exercise to the growing teeth and supporting tissues, as well as to give the saliva a chance to do its share in the process of digestion. "Remember to chew your food, your stomach has no teeth." The child must be taught mouth hygiene. He must be taught the value of a clean mouth, he must experience a clean mouth and there must be some supervision as to the manner in which the mouth toilet is made. He should be taught this motto: "Never to take off his shoes until he has brushed his teeth." Of course, the diet of the growing child should be carefully supervised; especially must the growing demand for sugar be checked. Present-day researches point out that the large intake of sugar is one of the greatest causes for decayed teeth. Americans, who use one hundred pounds per capita per year, have large numbers of decayed teeth. The Italians who use thirteen pounds per capita have few decayed teeth while they are in Italy. After they have been in this country and have partaken of our diet, decay sets in. Many Italians in the draft showed thirty-two teeth without a cavity, and few if any Americans twenty-one years of age can boast of having thirty-two sound teeth.

The digestion of certain foods begins in the mouth. If the food does not remain in the mouth long enough to be thoroughly mixed with saliva the digestion of starches and sugars is delayed until after the food passes out of the stomach into the intestine. If while the food is being chewed it is contaminated by material from cavities in the teeth, by fermented food from between the teeth or from decaying roots, or by pus from abscessed teeth or from inflamed gums, it will then be easily understood why the processes of digestion are disturbed with consequent irritation of membranes of the alimentary tract, and even possible derangement of the digestive juices themselves. The modern diets contain quantities of free sugar. Nature never intended free sugar to be used as food; it is too concentrated. When we consider that dental caries can only be produced from starch and sugar, and starch must be broken down into sugar before it can be digested it is quite true to state that

all dental decay is produced by sugar. In Bridgeport schools they use this truism in a jingle:

"Children you should learn this truth
Nothing but sugar decays a tooth."

In order to preserve the integrity of the teeth and surrounding membranes, periodic visits to the dentist are necessary. Modern foods are not coarse enough to cleanse the teeth nor do the people chew enough to get cleansing action from the food or enough to provide proper exercise to the teeth and gums. Therefore frequent visits to the dentist are necessary in order that he may find small defects in the teeth and in order that he may give regular prophylactic treatments to the surfaces of the teeth. Prophylaxis means prevention. A prophylactic treatment by a dentist or dental hygienist means a cleansing and polishing of the tooth surfaces leaving them in such a condition that the patient can maintain a clean healthy mouth.

The value of periodic cleansings and examinations may be emphasized by quoting a ruling by the President of the Metropolitan Life Insurance Company on April 29, 1919:

> The services rendered by the dental division since its establishment in 1915 have been so curative of impaired health conditions and so permanently helpful to the employees who have taken advantage of the opportunities offered, that henceforth every home office employee will be required to undergo examination and cleansing of the teeth in the home office dental division twice a year. If the service of the family dentist is desired rather than that of the home office dentists, such examinations and cleansings by him will be accepted, but they must be procured without expense to the company and the employee must furnish a satisfactory certificate from him that the required work has been done.

This ruling was prompted by a table showing a reduction of unclean mouths in the clerical force of the company who had had two cleansings each year for three years, in comparison with those who had had only one or two cleansings. It was shown that only 25 per cent of the first had unclean mouths, while 50 per cent of the second group was so classed. Twenty-seven per cent of the first group was classed as having clean mouths and only 10 per cent of the latter group. Clean mouths in this classification mean almost ideally clean.

Since 1918 these figures have improved. The 1920 reports state the first class has only 6 per cent unclean mouths and 39 per cent clean mouths.

It has been proved that oral hygiene for the school children which consists of cleaning and polishing of teeth, the removal of bad teeth and the filling of cavities will cut down disease and will improve scholastic standing.

Bridgeport, Connecticut, reports the reduction of disease in children and in left backs as follows:

Percentage of retarded children, grades 1 to 8 in September, 1912, averages 40 per cent, range being from 16½ per cent to 61 per cent.

In November, 1918, the average is 20 per cent, range being from 8.1 per cent to 33 per cent, a drop in retardation of 50 per cent.

The cost for retardation for 1912 equaled 42 per cent of the entire school budget, and in 1918 the cost equaled 17 per cent of the entire budget.

Reduction in cavities in the group which had received regular prophylactic treatments for five years ranged from 67½ per cent to 10 per cent. Total average for all schools amounted to 33.9 per cent reduction. The reduction in communicable disease is more startling. In 1914 the death-rate from diphtheria was 36.6 per cent, in 1918 it was 18.7 per cent. The death-rate from measles was 20 per cent in 1914; in 1918 it was 4.1 per cent. The death-rate from scarlet fever was 14.1 per cent in 1914; in 1918 it was 0.5 per cent. These children have received dental treatment in the schools for five years. The record of Bridgeport during the great scourge of influenza was an exceptionally good one. The deaths amounted to 5.2 per cent per one thousand population. This is the lowest rec-

ord we have been able to find as yet in cities approaching the size of Bridgeport.

The city health officer took the stand that since influenza was spread by the expelled secretions of the mouth and respiratory tract, the greatest means of suppressing this disease would be to make known to children and adults the dangers of coughing, sneezing, and spitting. He inaugurated an intensive educational campaign in theaters, motion-picture houses, and at all public gatherings regarding the contraction and spreading of influenza. During this period he stated that an intelligent background for this education had been prepared by the regular work of the dental clinic in instructing children individually and in distributing thousands of hygiene pamphlets in the homes for the enlightenment of the parents regarding common ways of spreading diseases and the hygiene of prevention. Five years of such education in conjunction with mouth hygiene played an important part in giving our citizens as a whole a more intelligent impression regarding contagious diseases, and the health officer and his co-workers had a more enlightened public to work with. He states further that "the most important side of this work is the educational opportunities afforded the hygienist. She is an important factor in raising the sanitary intelligence of the community—which is, after all, the object for which modern health workers are striving" (Dr. Fones).

Most of you know that the facts regarding physical impairments of the men of the country who were called to service in the draft were appalling. Only 46 per cent of our men twenty-one years of age were classed as effectives. The percentage steadily dropped as the age increased. At thirty years only 22 per cent were available as soldiers. From thirty-two to thirty-six years the effectives dropped to less than 15 per cent. Only 85 per cent of our men between thirty-two and thirty-six were unable to pass physical examinations for the army. Dr. Osler has stated that the diseases of which we die in adult life are those which are contracted or made possible in early youth.

Of what use is it to treat these men for physical ailments and then to let the new generation grow up with the same record. The prevention of disease will never come from medication but will come by educating the public to know causes and how to avoid them. This will be done by lectures and pamphlets to parents and by the teachers in our public schools.

There are more than fifty employers of labor in the United States who maintain a dental clinic for treatment of their employees. Most of these are for prophylaxis, examination, and advice. Relief of pain and reparative work are secondary considerations; in other words these clinics are based on prevention and education.

As already explained diseased dental pulps provide an open port of entry into the circulation for bacteria. Dental decay causes the death of dental pulps; therefore, if we prevent dental decay we will close this port. If we prevent inflammation of the gum tissue we close another opening.

In other words, then, all of the prevention practiced by dentistry must begin with mouth hygiene by the patients for a clean tooth never decays. Dentists are asked, "How often should I clean my teeth?" The dentist should answer, "As often as you use them and just before you go to bed."

The government, the state and the city spend vast sums of money to provide pure food and clean water. New York City spent one hundred and seventy-seven millions to provide reservoirs, and annually spends large sums to provide pure water to its people. Just think of what happens to that water when it passes thru the mouths of the inhabitants! By actual count six hundred millions of bacteria per cubic centimeter were found in a dirty mouth. Think of the work the intestinal juices have to do to counteract

those bacteria which are washed into the alimentary tract!

Two methods of cleansing the mouth are being taught in the public schools of New York City but I will describe the one that is credited to Dr. Fones of Bridgeport, Connecticut, called the rotary method.

There are two basic thoughts everyone must understand: first, it is a clean mouth that is our aim and not just clean teeth, and the other is that stimulation of the blood supply must be given in the mouth toilet because if not supplied by modern foods it must be done by gum brushing.

First the mouth is divided into three sections. The first section is that portion on the right side from the last tooth to the corner of the mouth; second section, that portion which extends from one corner of the mouth to the other corner; third section, from the left corner of the mouth to the last tooth on the left side. The divisions are the same for brushing the inside surfaces of the teeth.

The brush is held with handle across the palm of the hand with the thumb on top. The brush is then placed inside the mouth with the bristles pointing to the gum as high up as the check will allow; the brush is then brought downward and backward to the lower gums, then slightly forward and upward until a complete circle has been traveled. This circular motion should be a light rapid one and should be continued forward until all the teeth and gums in this section have been brushed. The grip on the toothbrush should be changed for brushing the left side. The thumb is placed underneath and the handle should be across the fingers and then the left side brushed as the right side was brushed. The same grip is used for the outside of the front teeth. One should count sixteen to twenty strokes for each area. For the inside lower surfaces the same grip as for the right-side outer surfaces should be made. The inside surfaces of all the teeth should be brushed with an in-and-out stroke. Each section should be given sixteen to twenty strokes by actual count. The inside of the upper teeth should be brushed with the same grip as on the left side; outer surfaces, with the brush reversed, that is, the thumb should be on the back of brush.

Floss silk should be used between the teeth. Great care must be exercised in its use so as to prevent injury to the gum. The floss must never be snapped past the contact point between the teeth but must be sawed gently until that point is past.

The tongue should be cleaned the first thing in the morning and last thing at night. This should be done with a piece of whalebone. The mouth should be thoroughly rinsed after these acts have been performed. Lime water is an excellent medium for this purpose. Lime water will precipitate the jelly-like plaque with which the bacteria cover themselves when attached to the teeth. This procedure will take from two to four minutes by the clock and a thorough toilet of the mouth cannot be done in less time.

PHYSICAL EXAMINATION AND MANAGEMENT OF ANESTHETIC COMPLICATIONS

By F. A. THOMPSON, M.D., Milwaukee, Wisconsin

(Read before the National Dental Association, Milwaukee, Wisconsin, August 15-19, 1921)

I HAVE found that in the past the duties of an oral surgeon and his work are gradually becoming a definite medical subject. The subject before us is that of the physical signs which will give you warning of trouble.

You are all familiar with shock. I need not dwell upon the advantages and necessity of your knowing definitely the occasion of shock. We may divide that into two or three divisions.

The first type to which your attention is called is that of the worried, anxious person, the one who has come to your office fearing whatever is to be done. They are anxious about the results, they question you as to whether there will be any danger. They usually are pale and anxious and may belong to the neurotic type. The answer to these people was worked out by Dr. Crile some years ago, who comforted his people, by placing them in the hospital a few days before he began his work. The anesthetic was given in the most gentle and wise manner possible and many of these patients did not know when their operation was started. You can avoid the anxiety in many of your patients by your own personal attitude. The man who will approach his work with confidence, with gentleness and assurance will sometimes work wonders. The man who makes a lot of fuss and who hurries around, who gives the patient the impression that he does not know what he is going to do, asks a lot of unintelligent questions, is very liable to engender in his patients a lack of confidence and anxiety.

The shock after operation, the second type, presents the cold skin, sighing, respiration, cold sweat, pallor and anxiety; a desire for more air is an indication for you to use prompt measures.

There is another type of shock, a third, which possibly you have not recognized. This is the type of very mild degree. It comes in the business man who has been hampered by reverses, anxieties, and his own personal condition.

The idea of this paper is to safeguard you by stimulating your observance of certain things.

The physical signs given in some of the types are many and varied. We will take up a few of the common things of which you may have full knowledge. We believe that the choice of anesthetic must be wise in certain types of serious cases, and, if your attention has been called to a few physical signs, many of your unfortunate experiences can be entirely eliminated. The nephritic type is very easily recognized. He has a pale, pasty color and puffy eyelids. He puts on pressure, he is logy and is usually cognizant of his condition. It is your duty to analyze his condition before any work is begun, unless it is work that is absolutely necessary. It is suggested that a microscopical urine is essential and it

would be better that he be placed in careful hands and a full estimation of his ability to excrete be measured by modern methods. He *does not make a good* subject for anesthetics or for any work in which there is any considerable shock to be employed.

The diabetic type may be one of two types: the plethoric, stout man who is evidently a good eater, whose color is a little cyanotic, whose breathing is a little rapid and who is not able to climb stairs easily. The other type of a true diabetic is usually thin, emaciated, anemic, his breath may have a fruity odor and he has known about his condition for years. It is needless to say that in these two types your choice of anesthetic must be wise, the amount of shock and traumatism produced of minimum type, and, if possible, they should be treated intelligently until they are in fit condition to undergo whatever is necessary in their cases.

The heart type, strange to say, which is not easily recognized, has been found to stand anesthetics quite well. These patients stand shock rather well. If, in your history of the patient, you do not find a direct history of heart disease, a few points of interest in your detection of them superficially might be explained. The fully compensated heart does not give many signs on inspection. The patients fatigue a little easier than the average, they are a little more dyspneic after exertion, are prone to have nightmare and are liable to be despondent. Occasionally you will find their finger tips blue and rarely they will be clubbed. A club finger is described as an enlargement around the nail region, and is wider than the rest of the finger.

The case in which the heart is not compensated would be easily recognized. There the breathing is very much labored in certain types, there is distress on slight exercise, the pulse is rapid and usually very irregular and this case should not be undertaken (unless in dire necessity) without intelligent medical supervision. Under careful supervision you may be able to undertake quite serious operations with comparative safety. This last type is rare. The first type or the compensated one is usually a good risk for ordinary operative work.

There is another type which we wish to bring to your attention, the asthenic types. You may classify these people as weaklings. The following are the classical signs of tuberculosis: continual loss of weight, constant loss of strength and appetite, fever cough, and the production of sputum. It is in the early types of these cases that the difficulty of diagnosis is sometimes found. You might classify in this grouping those children who sometime have had an attack of tuberculosis and are making their strongest efforts to overcome it. You can readily recognize the long, tall, spindly boy or girl who does not want to play very much, does not want to play with companions, who tires quite easily, who does not study well. He usually has large tonsils and adenoids; the glands of the neck are enlarged so that they are easily felt; this bony frame has been distorted by the lack of proper nutrition; the chest shape is abnormal, their muscles thin and flabby with no strength. Faulty dentition and malformed arches are present in this type.

The asthenic type, due to lack of proper food is found. They may or may not be tubercular. It is suggested that in these types of cases your work, if it is the removal of tonsils and adenoids and the correction of faults in the nose, will give greater satisfaction and at the same time give this child a greater lease on life, a better chance to grow normally, and a better chance to use its mentality. They are generally fairly good operative risks, but you should be well informed before any serious procedure is attempted that there is no active lesion in the lung. In case there is, it has been the experience of many men that a general anesthetic is not indicated.

There are a few other types which are rather rare but are of great interest. We refer particularly to these odd conditions which are mostly due to a lack of proper glandular secretions. The boy or girl with long arms and large hands, rather heavy types of features, whose long bones have seemed to have grown out of proportion, may be the beginning of the acromegalic. In this class also belong the long spindly girl who is at proper age for menstruation and has as yet not menstruated or the menstruation is scanty or irregular. She is anemic, is nervous and figity and many times suffers from a variety of headaches.

There is another type which is less recognized than it should be, namely, the boy or girl who early in his life has put on more weight than he should, who is deficient in his bodily hair, the hair is fine and silky, pubic hair is diminished, the sexual organs are small and undeveloped for the age. These cases should be examined and treated by intelligent medical men. As far as shock and operative interference they are usually good risks.

It has been the experience of many men to have sudden death, collapse, and various disagreeable occurrences in the office and in the hospital. A little survey, a little time, a little preliminary attention to a few of the points given above will, in the minds of most men who have paid attention to the subject, obviate a great many of these distressing occurrences. As your work in itself is not prone to great danger you can be comforted by knowing that the average patient will not come into these classifications. Be careful of the nephritic; of the plethoric man, whose habits have been that of the alcoholic in the past, who has been an extremely hard user of tobacco or who has stimulated himself by the use of coffee, cigars and alcohol and comes to you a shaking, nervous wreck. Your patient should be given the advantage of proper rest, medical supervision and attention before the work is accomplished.

To supplement these conditions that have been brought to your attention, it would be suggested that you equip yourself with a few sensible methods of combatting shock: a couch for your patient to lie down, blankets to keep him warm, electric pads, hot water bottles and methods of getting hot water quickly. As to drugs, a few simple things should be in your office ready for use. Aromatic ammonia, straight ammonia and the usual group of heart stimulants, digitalis, digitaleum, strychnin, pituitrin. In shock most of the time heat is needed, internally and externally. If your difficulty has come and respiration has ceased before your heart action has ceased, the use of the pulmotor must be thought of, as well as oxygen and fresh air. Do not place your patient in a zero breeze to give him fresh air; you are fighting cold and you will lose what you gain by doing so. If the weather or room is very warm an electric fan will help.

In conclusion, let it be suggested that you are safeguarding yourself by asking a few sensible questions of your patients, as to any physical ailment. Your patient's confidence in you depends upon your assurance in your work, upon the calmness with which you do it and by their knowing that you know your work.

Discussion

A. J. Wenker, Milwaukee, Wisconsin: Dr. Thompson's main point is precaution. I think too often we give anesthetics without due precaution and too often gas is administered or local anesthetic is administered with perhaps a large amount of adrenalin without taking the precaution to learn a few simple things.

I do not believe it is necessary to administer an anesthetic and perform an operation in every case. I have had cases on which I refused to operate. They were cases, for instance, such as broken-off hypodermic needle. I have in mind one case where I was supposed to remove such a needle. The patient upon examination was found to have a blood pressure of 170 with a considerable quantity

of albumin and a trismus of the muscles of mastication so that she could not get the mouth open. I worked with that patient until such a time as I succeeded in getting her reassured regarding local anesthetic. Naturally she was very much opposed to an anesthetic after the experience she had with the needle breaking off during a mandibular injection, and by avoiding a general anesthetic I believe I avoided a great deal of difficulty and complications which might arise. In all cases it is very wise to have a good heart specialist and in a case where it seems absolutely necessary to give a general anesthetic it is wise to have a man with you who will keep constant observation of the patient during the operation.

T. A. Hardgrove, Fond du Lac, Wisconsin: In discussing that class of cases where the heart is at fault, we should be able to make an examination of the heart to enable us to decide on the advisability of administering an anesthetic and the type of anesthetic to be used. We should bear in mind the exact pathology that involves the heart structure. Many of the types that he described are due to a pathologic condition of the heart muscle, an ordinary myocarditis. The patient's ability to stand the operation and to stand the anesthetic will depend on the strength of that heart muscle and that heart muscle's strength is sometimes expressed by the character of the pulse, so that when there is a feeble fast pulse it is usually an expression of a weakened myocardium, and associated with that you will many times find a low pulse pressure. The pulse pressure roughly speaking is the difference between the systolic and diastolic pressures. If it goes below one-third of the systolic pressure, it is a condition for concern. If it goes below 12 or 15 there is a condition in which it is not best to use any type of anesthetic. You can calculate exact on the basis of the pulse pressure how much of a certain drug can be administered. For instance, if a patient appears who in normal health would have a normal pulse pressure of 50, you would give him as a maximum dose 6, 8 or 10 grains of novocain. If his pulse pressure is only 24, you naturally would cut that dose in two. If it were only 12½, you would cut it in half again; in fact, you would not administer it. That is not an exact calculation but it is something to think about. When a patient comes in without symptoms but looks sick, there is a reason for his general appearance. It may be due to changes in the heart and kidneys and that is the type of case that is dangerous. The question of rest is the most important of all.

There is another element, fear. You can tell by the patient's appearance whether the pallor is due to fear or to some real pathology.

A. T. Rasmussen, La Crosse, Wisconsin: The essayist did not speak of the importance of knowing your patient's condition *before* you give an anesthetic of *any kind,* not only in those cases in which you have reason to believe the patient is slightly ill but in *every case.* You have no guarantee that the drug you are administering is going to act right in that particular case, especially if you are using a local anesthetic—and I do not consider a local anesthetic harmless or without an element of danger—but if you are using any drug which you inject hypodermically you should know the condition of the patient first. Your patient may be in what you believe or he believes is a perfect state of health and yet something may happen. I consider it absolutely essential in every case where an anesthetic is administered to make a physical examination before administering the drug or drugs in order that I may be prepared to cope with any emergency that may arise, either during administration of the anesthetic or the operation.

Preparedness is of the utmost importance in these cases for upon it may depend the life of your patient.

THE SURGICAL TREATMENT OF PERIODONTAL LESIONS

By JUSTIN D. TOWNER, D.D.S., Memphis, Tennessee

(Read before the National Dental Association, Milwaukee, Wisconsin, August 15-19, 1921)

DURING the past decade no profession, unless it be that of chemistry, has made more rapid and substantial progress than dentistry. In no direction has this advance been more pronounced than in the surgical treatment of periodontal tissues. Operations of this nature are now regarded as of prime importance to health, and more confidence is being expressed in the efficiency of thorough treatment, based upon competent examination and accurate diagnosis. The profession is awakening to a realization that it is truly a group of surgical specialists, or should be, and as such must deal with the soft as well as hard tissues of the mouth. This, together with a consciousness that dentistry has in its keeping the greatest health problems of the age, is responsible for the recent effort directed toward the control of that most prevalent and baneful disease, periodontoclasia.

Aside from prophylaxis, which has as its object the prevention of all disease, there is no more necessary work in the human mouth than the treatment of periodontal lesions. In the great majority of patients presenting today, these tissues are more often the seat of inflammation and infection than any other; a condition either the result, or cause, of general systemic debility.

Examination

Essential to intelligent surgery in all mouth pathology is a thorough oral and physical examination upon which to base an accurate diagnosis. No examination should be considered complete which does not include an inquiry into case history and habits of the patient, as often as necessary to determine obscure etiology.

The oral examination should begin with a survey of the buccal and faucial membranes and tongue. Mouth conditions present the greatest index to general health, and nowhere is this more plainly expressed than in the soft tissues, especially the tongue. While observing the faucial tissues, the slightest evidence of inflammation of one or both pillars will often lead to the discovery of tonsillar infection, which otherwise would pass unnoticed. True, tonsils are not within the domain of the dentist, yet their examination is so simple that it seems a duty to note the condition of this important adjacent structure, and refer its treatment when necessary.

The investing tissues should next be carefully examined to determine the character and extent of disease, or in the absence of pathology note their probable resistance. The gingiva, periodontal ligament, cementum and alveolar process always demand distinct and critical observation.

The dental structure should be carefully examined for faulty occlusion, especially traumatic, improper contacts, malposition, condition of filling and crown margins, caries, atrophy, hypoclasia, erosion, edentulous spaces, and pulpless

teeth. While the order as given here may be varied to suit the exigencies of the case, or the operator's preference, it is imperative that a definite routine be established, which will contravene indifference and tend to simplify the procedure. By the use of usual diagnostic aids, including the X-ray, reliable information may be quickly gained.

Figure 1 affords a splendid opportunity for noting all abnormal conditions found in an examination of the dental and investing tissues.

The physical examination, which should be referred to a competent internist or physical diagnostician, unless the

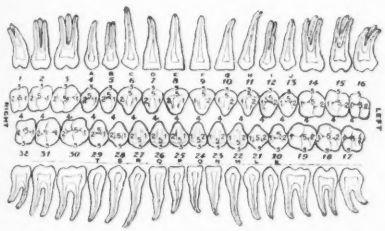


Fig. 1

dentist be qualified professionally and legally to pronounce dependable judgment, must take into account the accessory sinuses, tonsils, complete blood picture, urinalysis, heart, lungs, skin, digestion and elimination. This, at least, is necessary to determine the relative influence of oral and systemic disease, one upon the other, and to gain a fair idea of the tolerance and recuperative powers of the patient. Often this is the means of discovering some insidious disease, which, if not found, would eventually become incurable and hasten death. The more one studies physical conditions, the more convincing is the evidence that systemic pathology is a predisposing factor in the majority of mouth lesions.

We must constantly bear in mind that dentistry is first of all a health problem, and that any means of attaining this end is not only justifiable but obligatory. The dentist who calls to his assistance those of allied professions, who are capable of aiding in the great battle against disease, safeguards the physical welfare of his patients most. Only when it becomes necessary to first relieve pain should a competent examination be delayed, because upon this depends the accuracy of the diagnosis, so essential to intelligent treatment.

Diagnosis

Fundamental in all surgery is a diagnosis which implies the etiological factors entering into a pathological process. That diagnosis, which takes into account every evidence of cause and effect, and assigns to each condition its true influence, is a prime requisite of accurate prognosis and intelligent treatment. The physiological and pathological sense demanded in diagnosis is easily developed by all who appreciate its importance and come in close contact with health and disease. The fact that diagnosis and treatment are in inverse ratio to each other is no excuse for failure to detect disease early or attempt a cure when its presence forces recognition. Unfortunately repeated failures to control lesions of the periodontium, previous to a well-directed effort at diagnosis, has discouraged some who claim that all such conditions are incurable. These need to recognize this pathology in its incipiency when relief is easily accomplished. Others, however, have been stimulated to further interest in the underlying etiological influences and have developed their diagnostic judgment as well as skill in treatment. They are the ones who claim that periodontal lesions, whether a disease, per se, or evidence of systemic pathology, are amenable to treatment. This latter class are mostly periodontists, who, by proving their contentions, are doing a wonderful work in saving teeth and prolonging life.

Pre-Surgical

In all surgery, certain preliminary requisites are an essential part of any particular operation. In either gingival

or periodontal surgery, this preparatory procedure contemplates the prophylactic treatment of exposed tooth structure, beginning on the incisal or occlusal surfaces, provided the crown has sufficient integrity. The occlusion should be noted carefully and remedied if found to be in excess of the stress nature intended or more than diseased investing tissues will tolerate. If a tooth be left in excessive occlusion trauma will result and all other efforts to save it in health will not avail. In case of excessive tooth movement during mastication, as a direct result of inflamed or weakened supporting structures, its dis-occlusion will afford the rest necessary for recovery and will result in diminishing the depth of any pocket formation as occlusion is gradually reestablished. This, including the smoothing of rough surfaces, is doubtless what Dr. Bonwill was trying to impress upon us some years ago when he referred to the use of the carborundum wheel in the treatment of pyorrhea.

Contact points should next receive attention. If these are found normal in outline and position they should be cleaned with fine enamel strips, used in such a way as not to remove any tooth structure. In the event that these areas are flattened by wear to the extent of disarranging occlusion, or the teeth so spaced by reason of drifting, or caries, as to permit food impaction, these conditions should be noted for proper correction as a post-surgical procedure. Finally each tooth must be freed of deposits of every nature. Ill-fitting crowns should be removed, faulty filling margins remedied, and all exposed tooth surfaces are smoothed before subgingival treatment is attempted, as only by reduction of the area of irritation and infection can proper surgical approach be made.

Whether this procedure on individual teeth is followed immediately by surgery or the entire denture so treated first depends largely upon the tissue resistance in patients of low vitality and the operator's preference. Personal observation and clinical experience point to the advisability, in the greater number of cases, of completing a few teeth at each sitting. In this way the treatment is more definite with consequent greater benefit to the patient in practically the same length of time.

Surgery

The treatment of periodontal lesions is a distinct surgical procedure demanding a thorough knowledge of oral and physical conditions, intelligent selection and use of instruments, as well as persistent and painstaking effort. In no other surgery is there so little assistance from nature, which fact is indicated by a practical understanding of the individual structures, minute composition, and functions of the tissues involved. The first requisite, then, is a clear conception of the anatomy, histology, and pathology of the gingiva, periodontal ligament, cementum and alveolar process, and the etiology of their subtle and complex pathology. It seems clear that detachments of the periodontal ligament from cementum is the prime factor in bone absorption and consequent pocket formation, which permits serumal deposits. These fibers are first detached close to the cementum, and being absorbed finally expose the alveolar process to intrenched infection, which gradually accomplishes its destruction. Any tissue which remains has lost its special function, and when saturated with the products of decomposition it becomes negative chemotactic, thereby preventing reattachment. Thus we have a pathological process unlike any other in nature. This knowledge, so necessary to good surgical judgment, has generated a greater regard for the vital importance of these tissues and created more confidence in the efficacy of their treatment. Those who become dependable periodontists must begin here to build their proficiency in practice.

An important fact to keep constantly in mind is that recovery in all operative periodontoclasia is dependent, first, upon the systemic health or physical resistance

of the patient; second, upon the hygienic mouth toilet; and, third, upon the definite periodontal treatment. It is obvious, therefore, that the periodontist can neither assume nor be rightfully assigned the sole responsibility of a cure, regardless of personal desire or professional ability, since each patient has probably two-thirds, certainly one-half, of the obligation in permitting good service, taking proper care of the oral tissues, and right living. If these two principals, patient and practitioner, fail in the performance of their duty, one to the other, or to

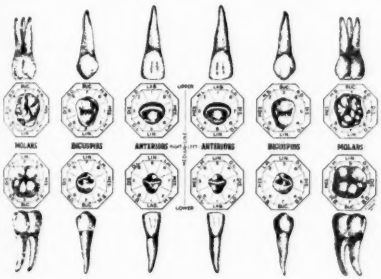


Fig. 2

themselves as well, the penalty is written in terms of failure.

The immediate objects to be attained in this specialized surgery are the removal of all serumal deposits, the curettement of denuded and infected cementum, and removal of all necrotic tissue down to healthy attachment. To do this and leave the tissues in a condition favorable to recovery or desirable regeneration demands the most accurate and refined surgery known. The deeper the crevice formation and the more restricted its area, the more difficult it becomes to remove every vestige of dead or dying tissue which acts as a constant foci.

Assuming that prognosis is favorable to the retention of all teeth so diseased in any given case or that indicated extractions have been done, the selection and use of instruments become fundamentally important.

An accurate conception of normal tooth form with respect to number of circumference angles, and the shape they collectively assume, together with surface outline, occluso-apically, and group position, such as anteriors, bicuspids, and molars, is essential in determining the number of instruments, as well as lateral position, form, length, and angle of blade for proper approach. Viewing any tooth in direction of its long axis, the circumference angles are found to represent an octagon, as seen in Figure 2.

This suggests the advisability of having an instrument for each of these respective surfaces, as well as for the degree of lateral angles at which certain blades are given off from the shank in order to approach and treat them with precision. The more extensive the subgingival crevice in the direction of the root apex, the more pronounced is this requirement. Then, too, (suggested by Fig. 2) it permits the same grasp and fulcrum support of all instruments of a certain group while treating the teeth for which they are designed.

The relative position of any particular group of teeth from the median line suggests the length of blade and determines the degrees of its angle to central axis of shaft. Instruments intended for the treatment of any given tooth under even fairly normal conditions should work equally well on all teeth of that group, whether they be right or left, superior or inferior.

Normal outline of crown or root (as seen in Figure 2) should determine the concavity or convexity of the blade. Practically all crown surfaces are convex occluso-gingivally, which fact indicates that blades intended for such areas should have concave faces. This form, provided the blades are long enough, will conform to crown surfaces, while its working plane passes beyond and dips into constricted neck areas (see Figs. 3, 4, 5). Beyond this point, a convex blade will more nearly conform to the concavity of root outline and should be used in all

cases where the gingival tissue is in situ. Concave and convex blades should be duplicates in width, length and angle. The rule should be, as stated previously, to have the curvature of blade follow closely the tooth form in the path of its working plane (Figs. 6, 7, 8).

The working plane should be at an obtuse angle to the blade. In this way the plane forms the actual end of the instrument which not alone permits it to work with either pull or push motion, but makes possible its extension into restricted areas to remove the dead tissue which precedes deposits. Failure to cure periodontal lesions many times is due to inability to go beyond the deposits or deep enough to reach and remove all necrotic tissue. It is manifestly impossible to reach this area in many cases with a working plane at right angles to the blade. Then, too, an obtuse angle plane converts the instrument into a curette, the best and most approved form used in subgingival surgery.

A caution against the selection of instruments with heavy blades is pertinent here for the reasons that they are cumbersome, will not enter restricted areas, tend to benumb the sense of touch, and unnecessarily lacerate tissues. Refined instruments are essential in delicate surgery. With the present-day manufacture of high-grade steel and improved instrument making, it is possible to construct an exceedingly delicate blade capable of standing great stress which rarely, even in extreme cases of tenacious deposits, exceeds twenty pounds.

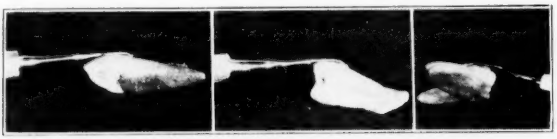


Fig. 3 Fig. 4 Fig. 5

Occasionally a condition arises by virtue of irregular position, mal-formation, unnaturally long teeth, unusually deep pockets, or partially closed bite, etc., which demands special instruments. These are necessary in order that one may be equipped to properly treat any unusual case encountered. They should be few in number, and have convex blades designed at slight variance with bicuspid and molar group formulas.

The trifurcation of upper and bifurcation of lower molar roots suggests another group of instruments, known as bifurcation curettes. These blades should be very delicate and concave in form with working point given off at a gradual curve, ending in oval tip. With these it is possible to gain direct access to and thoroughly treat such areas, though it should not be understood that where there is too much tissue destruction in the crotch of these roots, or the denuded surfaces can-

Fig. 6 Fig. 7 Fig. 8 Fig. 9 Fig. 10

not be sufficiently exposed to permit proper hygiene, it is advisable to treat them. Many teeth, however, are saved from destructive disease by having such instruments with which to treat these otherwise inaccessible positions.

Excessive free gingivae are constantly the seat of disease, and should be deliberately resected in case other treatment fails to restore them to normal. In this way pockets are eliminated and denuded root surfaces exposed to facilitate cleaning. The new gingival line established, though abnormal in position and form, is

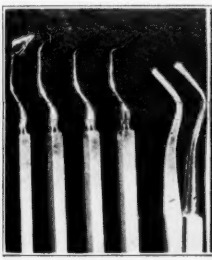


Fig. 11

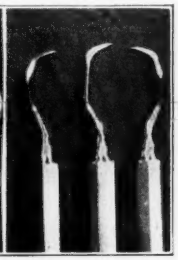


Fig. 12

resistant to disease and consequently more protective. The free gingivae should rarely exceed 1 mm. in depth of detachment, if they and the periodontal tissues which they protect are expected to remain in health. For the purpose of their resection small double-edged knives of suitable angles may be used to best advantage. The incised area should be properly cauterized to prevent subsequent infection and formation of blood clot, which supplies the plasma necessary for new growth. These instruments are known as gingival resectors, and may be limited to four in number. With these should go a tissue forcep to grasp and hold the gingiva as an aid to positive resection.

For general purposes on all exposed tooth structure a set of three "ordinaries" are needed. One of these should be a straight triple angle, contra-angle for anteriors. The other two, right and left, are of the same general form, but with the blade of each given off at a lateral angle sufficient to permit easy access to bicuspids and molars.

Both length and size of shank are important considerations in instrument selection, as they bear a definite relation to a positive working plane. A short shank makes a more balanced instrument and one which permits better control, because its end is nearer the shaft. This throws the grasp, as a rule, on the shaft, where it belongs, instead of shank, as is often the case when this desirable requisite is ignored. The shank should be of

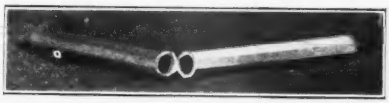


Fig. 13

good size to allow sufficient bulk of metal for large bearing surfaces so essential to finger fulcrum.

The size, form and character of instrument shaft demand special consideration. The size must be sufficient to permit a firm and delicate grasp. Firmness is essential to positive control and delicacy of touch, though beyond a limited degree it is a hindrance to both. A size one-quarter inch in diameter is preferable, as a smaller one requires so much finger pressure in management that the keen digital perception is benumbed. The form of shaft, which seems best suited and for that reason generally used is the octagon. The advantages claimed for the round shaft do not seem sufficient to create any special demand for their manufacture. Among the many advantages of the hollow shaft for instruments of this type are its light weight in comparison to size, extreme sensitiveness of touch, and splendid conduction of sound, all so necessary to complete the discrim-

inating instrument demanded in this branch of practice.

The skilful use of an instrument armamentarium selected to meet the most exacting requirements of approach, control, delicacy, sensitiveness, and positive end plane, is just as fundamental to success in periodontal surgery as a knowledge of histo-pathology of the structures involved, and their hygienic after-care.

To become adept in the technic of this specialized surgery is not beyond the ability of all who recognize the importance of these lesions and desire to become proficient in their treatment. It cannot be truthfully claimed that those who become skilled in this practice have any God-given genius, which entitles them to special consideration. While an intuitive sense is an advantage, it only takes determined effort and experience to acquire the training essential to the mastery of these rather simple details. In short, all who appreciate the necessity of this work may develop their ability to accomplish it.

It is important to understand that the local treatment of periodontal disease is almost wholly instrumental and is applied chiefly to exposed and denuded tooth surfaces. The next simple fact is that coincident with the removal of mechanical irritants, the bacterial invasion is reduced to a margin of safety and cell vitality stimulated to the point of ultimate recovery, provided proper hygiene is maintained.

In the removal of subgingival irritation caused by dead periodontal fibers, necrosed cementum and serumal deposits, care should be taken to make the approach with definite precision and delicacy of touch, which precludes unnecessary tissue injury. It must be remembered also that even in the absence of mechanical injury infection is being pushed directly into the soft tissues as instrumentation proceeds, and for this reason only a limited number of teeth should be treated at any one time, the exact number, of course, depending upon the severity of the disease, tissue vitality, and tolerance of the patient. While direct tissue infection or auto-vaccination favorably influences substantial recovery, there is no reason why patients should be subjected to overdosage, as sometimes is evidenced by rigor and fever, rather than the mild accumulative effect of small doses.

All instruments intended for subgingival surgery must be delicate, sharp, and sterile. Their blades, including working planes, should be thin enough to enter even a normal gingival crevice without undue extension of this important membrane; they should be sharp to facilitate the discriminate treatment of root surfaces with the least discomfort to patient; and sterile to prevent the introduction of alien micro-organisms. By far the safest procedure, with respect to sterility subsequent to boiling is to pass the blade end of each instrument through some iodin solution, such as a disclosing agent, before introducing it underneath the gingival, not alone for its germicidal effect upon foreign organisms, but protective influence against resident infection.

With short, positive, though delicate strokes, extending further apically each time, thus clearing the instrument path, and gradually working around the root, changing instruments when necessary rather than position, a simple and definite technic productive of positive results is easily established. In all cases, wherein no particular area may present an emergency, it is well to establish a point of beginning and follow the denture in regular sequence until the completion of all surgery. The point of first attack may well be the last tooth on the superior right, which, if in situ, is No. 1 on examination chart exhibited in Figure 1.

The sensations which an instrument should convey when introduced into pockets are: first, the cushion-like contact with soft tissue, as the gingiva and remains of periodontal ligament; second, the gritty feeling when working plane touches serumal concretions; third, the

choppy sensation typical of pus-soaked and necrotic cementum; and finally, the velvety feeling indicative of hard and smooth root surface. This last signal is evidence of completed surgery of that particular part, and any attempt to go beyond it will result in over-treatment.

Therapeusis

Oral therapeusis should, at all times, contemplate the use of only the simplest agents, which will exert a protecting influence against acid-forming organisms and stimulate the tissues to normal function. A bland wash, which also may be used as a spray to bathe the tissues and flush out debris, composed of isotonic sodium chloride as a base, with a 1 per cent aqueous solution of benzoic acid and sodium borate in water soluble menthol will insure sufficient flow of saliva, tend to inhibit pathogenic organisms, and induce better care of the oral tissues. There is certainly no place in this field for highly alcoholic, or astringent preparation. As a rule the best therapeutics are water, exercise, rest, and simple hygiene.

In using the pneumatic spray during surgery, one should be careful not to disturb the final blood clot, which forms after instrumentation as nature's protective and building agent. Another caution, which may well be included here, is never to stop surgical treatment within any interdental space. Unless all root surfaces approximating this space are treated at the same sitting, subsequent surgery of any unfinished area will disturb healthy granulations and delay recovery.

Post-Surgical

Without entering into a liberal discussion of post-surgical procedures at this time, mention may be made of the most important essentials. Aside from the simple local and systemic therapeusis, which is at times indicated, fillings, crowns, bridges, splints, and orthodontia must be considered as following surgery when there is the least evidence of periodontal lesions. Coincident with, and after, any dental operation applied instructions in the personal care of the mouth should be given. Those who are interested in my views upon this subject are referred to "Oral Prophylaxis," published in the *Dental Summary* (January, 1921, p. 32), and "Instruction of Patients in the Personal Care of the Mouth" (*Items of Interest,* January, 1921, p. 65).

Discussion

M. H. Garvin, Winnipeg, Manitoba: I would like to know how to sterilize instruments. I have been boiling them for years and find the temper is slightly drawn, and if Dr. Towner knows of any better way than boiling I would be glad to hear of it.

I would like to ask, also, if he has any recommendation concerning the overcoming of grinding the teeth during sleep. I would also like to know when Dr. Towner would extract. It seems to me that in a molar tooth when the bony process is definitely broken down between the roots it would be safer to remove the tooth at once. It would seem wise also to give the mouth one general prophylactic treatment before commencing the root surgery.

In closing may I ask whether in treating dental periclasia where the gums are anemic, the root surfaces extremely sensitive, no inflammation, and very slight if any pus formation would Dr. Towner still rely upon instrumentation and local treatment alone.

Elbert J. Weaver, Milwaukee, Wisconsin: What the clinical examination of a mouth reveals today is almost an index of the general physical condition. I think eventually we will be competent enough to recognize from the appearance of the mouth what is the predominant cause systemically of some of these conditions which are presented for our attention.

In regard to instrumentation, I would like to ask Dr. Towner if when he finished that operation he proved up that work so that he is absolutely sure that he has removed all deposits.

I would like to hear Dr. Towner explain how he uses his instruments as curettes.

Another question: In treating loose interproximal fibrous tissue, by burning with acid, would scar tissue be formed in the inner margins, which might stop the ingress of bacteria?

L. C. Burgard, Louisville, Kentucky: I shall direct the major part of my discussion to the surgical treatment as systematized in our office for all advanced cases. This is best termed "tissue resection."

By reviewing our histology we find that the periodontal membrane forms the attachment of

the supporting tissues to the tooth, and that this membrane is imbedded in the cementum. By reviewing the pathology involved we find that this membrane in all pyorrhea pockets according to the duration or chronicity of the infection along with the cementum has been destroyed. If the cementum is involved as such, then how can there be any reattachment of the supporting tissues, regardless of any instrumentation, because its media, the periodontal membrane, is lost, and certainly there can be no regeneration of same, since it springs from the cementoblasts.

Having clearly established the histopathology our operative procedure ought to be outlined on this. Let us take cases that so often present themselves: the buccal and lingual plates and tissues little involved or destroyed but with deep intervening troughs and pockets; or the case with a pocket extending down to one-half of root apex and encircling only half of the tooth.

Instead of having a long drawn out treatment, it is done surgically. After two or three years, we find a gradual regeneration of tissue and a filling up of this space beyond which we often would dare to presume. Because just as far as the cementoblasts are not destroyed after having established full and free drainage nature will start regeneration.

I can recommend this since I have cases of ten-year standing and know whereof I speak; previously we used the tedious method of delicate scraping instruments. When the truth of surgical treatment becomes more established it will become the universal treatment for all *advanced* cases.

Of course it is to be understood that regardless of the treatment, trauma, mechanical or septic, must be most vigilantly searched for and obliterated. Many pyorrhea specialists who do not do their operative work as it pertains to restorations have but a vague idea of two very pernicious foci for reinfection. Amalgam fillings, which to all intents and purposes are good fillings from clinical evidences, invariably have leaky cervical margins, which it is not possible to detect by exploring points. The same holds true with small cavities right in the contact point. I make it a rule to remove every alloy filling where gum refuses to respond to treatment.

I pay little attention to the constitutional condition, unless there are kidney lesions present. I have seen young persons of athletic type, who take the usual care of their mouths, with gingivitis and well-defined pockets. Then I have seen dyspeptics who do not know the meaning of health, and there is no tendency to infection.

I will close by saying last but not least of all the treatment and advice is the brushing. We must teach our patients to brush their teeth until they look clean, polished and wholesome. Besides the cleansing there is an invigorating effect caused by the brush friction on the gums and a consequent toughening.

K. S. Perry, Pittsburgh, Pennsylvania: I agree with Dr. Towner in the principles advocated in his paper. In regard to the necessity of removing necrotic membrane or tissue, it is a positive necessity. I have attained the best results by the use of the electric cautery; its use leaves the field sterile and aesthetic results may be obtained. As far as the patient is concerned it is more agreeable to use the cautery than the knife. In chronic cases it is very often expedient to use the cautery at the first sitting.

In reference to the control of the patient, the necessity of which we all realize and the importance of which was very forcibly impressed on me about twenty-five years ago, I wish to relate the following incident: While visiting the late D. D. Smith, of Philadelphia, a patient came in whom he had repeatedly reproved for not following his instructions. Feeling that it was useless to persist, he summarily discharged her, notwithstanding the fact that her case was not completed. Although the procedure, at that time, was considered a little radical, I have since concluded that Dr. Smith was justified in discharging the patient. Without your patient's hearty co-operation you can accomplish very little.

Ionization is another method of stimulating cell life, but before deciding to treat a patient by ionization it is advisable to pause and consider what the component factors of the patient's condition are. In a septic area, for example, we should ask, are the tissues infected by a bacterium? Are they irritated by a well of putrefying discharge? Is this well mechanically accessible in its whole extent? If the tissues are infected, treatment by a vaccine or serum is rational. If there is a putrefying well it is also rational to wash this out, fill the cavity with zinc solution and ionize the surface layers of the wound.

Dr. Towner (closing): As regards the grinding the teeth during sleep, I have not found anything in my experience to cure that except to keep the patient awake. I have made very extreme efforts to get those teeth in proper occlusion. Wherever there is grating of the teeth there is traumatic occlusion and, as Dr. Bricker says, altered "abnormal surface wear."

A question was asked about the excessively diseased bifurcations. We are able to save some teeth so diseased. I have brought to mind by this question the case of a patient whose lower left third molar was not diseased except for a bifurcated area. That area was badly diseased and I not only treated it but resected the tissue around the alveolar process and left it open and that tooth today is as healthy as any third molar could be. In other cases I pack the tooth after surgery, lifting

the tissues away, and then fill the space with Ames' black copper cement. I use Ames' because it is the original and seems to act better than any other. That will eliminate the area and it will not need any packing. Most of the cases are condemned to extraction but we have so many things to take into account that we cannot touch them all.

In regard to having prophylaxis first, I think that is a splendid idea. I believe when anyone practices this specialty he should surround himself with competent people, specialists in prophylaxis and orthodontia. We free the exposed surfaces of all material and then we get a good idea of the patient's seriousness and effort toward keeping the mouth clean. Sometimes the patient never gets to the surgery in the work because they show so little interest in helping that they are not desirable. That is why I stressed the point of assuming only one-third of the responsibility.

In regard to the cases with anemic gums and no evidence of periodontal lesions, etc., we have a condition which was formerly very prevalent but which is not so prevalent now, and in those cases we find a wasting away without any apparent local cause and they are the most difficult to treat and handle. When you refer them to the surgeon and he wants to know something about them you are at a loss, but I am just as particular in those cases as in the other types because it is absolutely necessary to remove all that dead tissue periodontically because all other efforts at relief will not avail anything. The fundamental thing is systematic treatment.

The mouth condition referred to by Dr. Weaver is important, but fundamental to all mouth treatment and mouth hygiene is the physical resistance of the patient. Unless there is normal resistance in one place it is not apt to be in another and as soon as we as professional men view mouth tissues as all other tissues in the body we will have more success and the saner will be our remedial efforts.

As to proving up the work, that is very important. The truth, as I see it, is that you must prove everything you do. You must know that in treating periodontal lesions you are treating in the dark, and that is why I mentioned the instruments that give the best result. I prove up every tooth and my rule is never to stop in the interdental space, because if you stop distally today and then begin mesially on a bicuspid the next time, you are breaking up the tissues that are so necessary. I do not do it with any special instrument but try to make one instrument do the whole thing; I remove all sorts of deposits or necrotic tissue and prove to myself by sense of touch that the root surface is absolutely smooth. When a certain area fails to heal it is expressed in the tissue and I remedy it. I do not follow the instruments I am now advocating with files, as I formerly did. As to the curettes, by bringing the working band off from the plate at an obtuse angle instead of a right angle you are nearer the approach to a curette than in any other instrument.

In gingival resection and scar tissue referred to by Dr. Weaver, I wish to say that whether the gingival tissue is deliberately dissected or recedes normally to the alveolar line there is an abnormal gingival line. You have a blunt surface which cannot be avoided and the scar tissue which is formed, in my opinion, when it is kept clean and free, is just as resistant to infection, if not more so, than the normal tissue itself.

EDUCATION OF THE PUBLIC IN ORAL PROPHYLAXIS

By FREDERICK A. BRICKER, D.D.S., Rochester, Minnesota

(Read before the Chicago Dental Society, January 19-21, 1922)

THE problems of oral prophylaxis and preventive dentistry are worthy of the close attention of every member of the dental profession, whether his practice is specialized or general. We who hold degrees as doctors of Dental Surgery share in the responsibility for the nation's health and must furnish capable and enthusiastic leadership for the movement in oral prophylaxis. Although I realize there are many phases of preventive dentistry, I wish primarily to emphasize the necessity for creating earnest co-operation on the part of the patient in maintaining a clean mouth.

Oral prophylaxis! Is there any subject in the curriculum of dentistry so much talked about and yet so little practiced? Sir William Osler remarked: "The knowledge which a man can use is the only real knowledge, the only knowledge which has life and growth in it and converts itself into practical power. The rest hangs like dust about the brain or dries like raindrops off the stones." Our knowledge with regard to oral prophylaxis is capable of valuable application and must be disseminated.

A persuasive teacher of the value of preventive dentistry must possess a thorough and comprehensive knowledge of his subject; he must know far more than he will ever be able to impart to others. It is also necessary that he be so convinced of the truth of his message that he will impress his hearers with the importance of the facts and instructions he gives. Thus the lessons he imparts will be retained; his patients will leave his office thinking of the vital facts he has told them rather than of the style of his gown or equipment.

In the past few years it has been my privilege to meet many dentists and I am impressed by the fact that few of them recognize periodontal disturbances and still fewer care to do so. Moreover, only a limited number are willing to devote the time required to learn the basic principles involved in the recognition and treatment of such disturbances. Recently an instructor in a Class A dental college informed me that only slight attention is given to the teaching of oral hygiene. A senior from another Class A school remarked that the amount of instruction he receives in this subject is almost nil. What can we expect of the public when graduates from our best dental colleges are so meagerly informed on this most important subject? The fallacy of such neglect is brought out in the writings of celebrated medical authorities. Mayo asserts: "The starting-point of a very large part of preventive medicine is in the mouth" and Osler says: "There is not one single thing more important to the public in the whole range of hygiene than the hygiene of the mouth."

Propaganda with regard to oral pro-

phylaxis must begin among members of the profession and must be carried by them to the individual patient. The trend of education today is toward direct and individual instruction. Although it is acknowledged that the education of the public in oral hygiene en masse is a failure, similar instruction given personally is undoubtedly successful. Patients must continually be reminded of the cause of decay and periodontal disease and they must be taught methods of prevention by actual demonstration. The dentist should show the patient how to brush his mouth so that he will recognize by the sense of touch whether or not he is doing it correctly. The professional man himself must educate his eye to see, his ear to hear and his fingers to feel the difference between normal and abnormal conditions in the mouth. Such qualifications are necessary in the making of correct diagnoses.

With regard to the importance of individual instruction Dr. Hunt, the chairman of the Minnesota Committee for propaganda on the prevention of cancer, has said: "We aim to talk to every club or group of people and the smaller the group the better. It is the individual instruction that is going to attain the results we desire."

It has been conclusively determined by competent investigators that diseases of the periodontal tissues are the result of infection by organisms which are common in all mouths. It is during the early stages that the disease process requires the most careful attention, for it is only then that curative treatment can be instituted with a good prognosis. Greater consideration must be given to the soft tissues, the gums, pericementum, and the pulp, for these structures are the ones principally involved in permitting invasion by bacteria with consequent systemic infection. Dr. Black presented a paper before this Society a year ago in which he described, by drawings, the perivascular lymphatic system through which bacteria around the necks of teeth may travel before localizing as foci.

An understanding of the importance of massage of the gums by means of the toothbrush is dependent on a knowledge of the anatomy and physiology of the blood supply. The small arteries which enter the apical space form numerous branches; one or more of these enter the root-canal at the apex, the others pass on through the periodontal membrane to the alveolar border and gum tissue. The arteries give off and receive branches through the alveolus and connect with the plexus of the gum tissue. Thus the arterial circulation in the gums is intimately associated with that of the periodontal membrane. Therefore, in order to stimulate the blood supply in the periodontal membranes it is necessary to stimulate the circulation of the gum tissue.

During the mastication of hard foods a natural massage takes place by the pressure of both the teeth and the food. The teeth, which are occluded with considerable force because of the resistance offered by the food, are pressed back into their sockets and the blood in the periodontal membrane is expelled from its vessels. As the jaws open the pressure on the teeth is released and the blood rushes back into the vessels. The part played by the food itself in natural massage of the gums is equally important. The hard foods slide off the cusps, press on the gums of both maxillary processes, and produce a reaction similar to that of massage of the tissues on the surface of the body. Such a process stimulates a free flow of blood and prevents congestion or stasis in the capillary circulation. Because of the addiction of the present generation to soft foods, it is imperative that we resort to artificial stimulation of the gums tissue, that is, to the toothbrush.

The greatest amount of absorption of the alveolar process occurs at a point beneath the gum septum which is also the point of greatest congestion and lowest resistance. It is this region, therefore, which is in most need of stimulation by working the bristles between the teeth. Moreover, the bacterial placques on the interproximal surfaces may thus be broken up. The brush should always be forced back until it is felt on the gums distal to the last molar. In other words, starve the bacteria by cleansing the mouth and feed the tissue by stimulating circulation.

Oral prophylaxis demands that all the cells be kept in the highest state of physiologic efficiency. Resistance depends on cell vitality; cell vitality depends on nutrition; and nutrition in turn depends on the capillary circulation supplying the region. Therefore, any condition which interferes with capillary circulation lowers the resistance of that part. In unclean mouths the cumulative masses of fermenting debris and mucous films around the necks of the teeth form the irritant which lowers the cell's resistance and offers an excellent soil for gingivitis. Gingivitis is preventable and curable mainly by the patient's own efforts, and it is criminal negligence to overlook incipient gingivitis because of superficial and hasty examination.

Although full-mouth roentgenograms are valuable adjuncts to dental diagnosis, the inclination to determine the condition of the mouth and teeth on this basis alone is deplorable. A thorough clinical examination is necessary to detect pathologic conditions of the soft tissues and abnormalities of the teeth. Dr. Bunting's method of analysis is very useful in diagnosis:

1. Color. The normal gum tissue has a uniform color and any change in this uniformity indicates that the tissue is abnormal.

2. The normal position of the gum tissue is about the necks of the teeth. The abnormal conditions are of two kinds: (a) retraction or shrinkage, (b) hypertrophy or swelling.

3. Density. Normally this tissue is firm, hard and resistant to touch. When injured it is soft, spongy, and bleeds easily.

4. Line of attachment. Normal tissue is firmly attached to the teeth. True periodontoclasia does not exist as long as the line of attachment of the soft tissues about the root remains normal. A space must exist between the root and the periodontal tissue to be abnormal.

5. Pus. Such a case shows that there is an active process going on.

6. Radiographic findings.

Courses in psychology, offered in our dental curriculum, might enable us to understand the mental appeal which would persuade our patients to maintain clean mouths. Dental societies might well devote more time to the discussion of preventive procedures, means of securing patients earlier than at present, and methods of eliminating pathologic processes in the early stages and before radical measures are indicated.

I have questioned three hundred patients and find that only 2 per cent have any information with regard to the cause and result of decay and periodontal disease. More teaching would have lowered the percentage both of diseased mouths and bodies. Today the more eminent the dentist the more ready he is to inform his patients on the proper care of the mouth.

Inform the patient that decay is a disease of the teeth which in 80 per cent of cases may be prevented by brushing. It does not occur on the high points, but always begins in the concealed or protected places, such as in the fissures of the bicuspids and molars, around the gum margins, on the approximating surfaces, and on the buccal surface of the posterior teeth, especially those in the upper jaw. These are the localities which remain practically untouched by the bris-

tles of the brush when brushing is not properly carried out.

Impress it on the patient that "to cure" means to restore to health, not to make immune, and that it is his duty to maintain the normal, healthy condition by removing the film and stimulating circulation. If we can attract the attention and arouse the interest of our patient we will create a desire for clean mouths.

Give your patient proof that a clean mouth is a money-saving proposition as well as one of the best health policies he can obtain. Teach him that an unclean mouth is a predisposing cause of such diseases as anemia, arthritis, nephritis, cystitis, myocarditis, iritis, appendicitis, and gastric and duodenal ulcers. Such instruction would make us a hundred fold more beneficial to our community than do postgraduate courses in crown and bridge-work, removal appliances, and so forth.

We are the instruments employed in the molding of public opinion to a better realization of the necessity of thorough cleanliness in the mouth. Whether or not we are successful in our undertaking depends partly on our efficiency as educators and partly on the response of the public. The attitude of the dentist, however, should be one of clear cut, strong, and fearless leadership.

Bibliography

Black, A. D. "Cinical Studies of Pulp Treatments, Including Report of Fifty-one Cases in Which Dead Pulps Were Removed," *Jour. Nat. Dental Assoc.*, VIII (1921), 134.

Bunting, R. W. quoted by Rattner *Northwestern Jour. Dent.*, (1921), p. 9.

Hunt, V. C. Personal communication.

Mayo, C. H. Personal communication.

Osler. Quoted by Finney, J. M. T. "A Personal Appreciation of Sir William Osler," *Jour. Amer. Med. Assoc.*, XXVI (1921), 2013.

THE EXAMINATION OF TEETH IN GROUP MEDICINE

By BOYD S. GARDNER, D.D.S., Rochester, Minnesota

(Read before the Southern Minnesota Medical Association, Mankato, December, 1921)

THE literature on dental subjects for the last few years does not give credit to the value of full mouth roentgenograms and the necessity of such examination apparently is not entirely appreciated either by the medical or the dental professions. Certain members of both professions still consider it quite ridiculous to examine, roentgenographically, the mouth of a patient wearing a full upper or lower denture. However, Euserman's findings, in a study of roentgenograms of the mouths of 290 patients wearing either full or partial dentures, have demonstrated the importance of this phase of our work. Obviously a full mouth examination not only is necessary, but the patient's due, if he is suffering from a systemic condition and a focus of infection is suspected. Besides this group of patients are those who are undergoing thorough examinations from the standpoint of prevention of disease.

In diagnosing affections of the teeth, the existing pathologic condition should be visualized as it is when the teeth are removed surgically. The open view operation has made this possible since the exact condition may be seen, while with the older methods it is necessary to work more or less in the dark. For this reason it is important that the dental diagnostician should have surgical training.

If complete extraction is necessary and a full denture required, especially in elderly persons, it is well to explain carefully the probable results. Many patients are shocked by the change and regret having had the extraction. While the elimination of dental infection is of primary consideration, nevertheless the dental surgeon should keep in mind that the patients are to have dentures and that cooperation with the prosthodontist should begin before operation. In many instances pre-operative models and facial measurements are advantageous.

It has been proved beyond doubt that a casual glance into the mouth with the idea of noting suspicious teeth, such as those supporting bridges and crowns, or holding large fillings, and so forth, is worthless. The deciding question is whether or not the clinician actually wishes to know if the teeth with their investing tissues are to be considered possible factors in the condition of the patient. This conclusion can only be reached after the examination of thousands of patients by full mouth roentgenograms. Residual roots, granulomas, and impacted teeth are often found under plates that have been worn for many years, and their removal has relieved many patients suffering from systemic disorders, particularly iritis, and one type of arthritis, neuritis, and so forth.

The roentgen-ray evidence should be

carefully considered while the patient is under observation. The many advantages in checking up the clinical and roentgen-ray evidence at the same time cannot be overestimated. The full mouth roentgenogram makes it possible to compare densities, which is just as necessary in dental work as in orthopedic work, when, for example, an abnormal condition of the right knee can best be demonstrated roentgenographically by a comparison with a normal left knee. Likewise in dentistry, the lower first molar may appear to be abnormal, but on comparison with the opposite first molar, one may be surprised to see that the condition is normal.

During the past year, approximately 28,000 patients were examined in the dental section of the Mayo Clinic. A review of the histories of these patients disclose ample evidence that the usual method of extraction is far from adequate. Residual roots and granulomas, as well as impacted and unerupted teeth were not infrequently found in supposed edentulous areas. Thirty per cent of these patients had roots, 4 per cent had impacted or unerupted teeth, and 3.5 per cent had residual granulomas. With the pen view operation of extraction which is now known as alveolotomy, it is practically impossible to overlook such conditions; this is proved by postoperative roentgenograms made routinely. The literature abounds in criticism of this method, yet when it is carried out with proper restriction the results are most satisfactory.

Physicians should encourage the routine examination of teeth except in hopeless or emergency cases. Time is an important factor in emergency cases; however, the dental examination can be postponed until during convalescence after operation. The condition for which the patient is operated need not necessarily be due to mouth infection to warrant the dental examination, but the elimination of such infection is of material aid in the after care of the patient, and in the prognosis.

Oral infection cannot be eliminated by extraction alone. Treatment for pyorrhea and thorough prophylaxis are both often necessary. Great care should be exercised with regard to the number of teeth extracted at one time, and the length of time between operations. This is also true of prophylactic treatments. There should be a limited amount of scaling at the first appointment and it should not be repeated for several days.

The profession of dentistry should be discouraged from making promises to patients as to the possible result following the extraction of teeth with evidence of infection. They need the co-operation of the physician and are only responsible for the field in which they work. An intelligent report with regard to the dental findings is desired from the dentist by the physician who should take the responsibility of advising and encouraging the patient as to the outcome of the dental treatment.

The dentist in making his report divides the teeth into two groups: those which should be removed for local reasons, and those which should be removed when systemic conditions warrant the procedure. Therefore, the removal of teeth in patients in the first group is a question for the dentist to decide, providing the patient's physical condition is such that they can stand the operation, and of those of the second for the physician. Teeth with marked evidence of infection at the roots, certain types of impactions and teeth affected by pyorrhea to such an extent that treatment is of no avail, compose the first group. In the second group are listed pulpless teeth that are negative to the Roentgen-ray, and their extraction is

advised only when the systemic condition is traced to a focus. Thus many patients are allowed to retain pulpless teeth, which however should always be considered questionable. Therefore, to say that all pulpless teeth should be extracted is doubtless too radical at the present time.

Conclusions

1. It is necessary that the dental report shall be based on the Roentgen-ray, making use of full mouth pictures, and by clinical evidence.

2. Co-operation between the medical and dental professions is necessary in order that concusions may be reached with regard to the teeth which should be sacrificed.

3. The dentist should be discouraged from making promises with regard to the outcome of extractions.

4. The extraction of teeth by simple pulling is not adequate or justifiable.

5. The results from the extractions of teeth by the method known as alveolotomy should be encouraged with proper restrictions.

Bibliography

Eusterman, M. F. "Roentgenographic Findings in Two Hundred and Ninety Partially Edentulous or Edentulous Mouths," *Dental Cosmos*, LXIII (1921), 901-3.

Discussion

Thomas B. Hartzell, Minneapolis: Partial examinations are only misleading, and I would like to urge that in all cases, after removal of diseased teeth, checking up of the work by a radiograph is necessary, and I believe most men will agree in a short time that is important and should be done. In addition to a complete X-ray examination, emphasis should be placed on the fact that in co-operating with medical men the dentist should have a complete diagnosis of his patient. If a dentist is advised to extract teeth by the physician without knowing what the physical condition of the patient is he must rely on his own judgment and his judgment cannot be complete without a good foundation laid by himself or by the physician. If the physician does not hand him this advice with the patient, he is under the necessity of making the diagnosis himself. I have employed a technician for some years at considerable expense, and I operate on no case without a proper and complete examination.

In regard to removing bone from the labial surfaces of the teeth in making extractions, I know that it is done under proper restrictions. As I understand it, the idea now is that we will not sacrifice the alveolar process of the jaws any more than is absolutely necessary. I am absolutely in accord with that proposition. There has been a phrase among dental operators for some two or three years back to peel back the periosteum, to traumatize the tissues and remove so much of the alveolar process that many of these patients have been unable to wear artificial dentures. Any one who is robbed of his masticating organs and cannot wear an artificial denture is in an unhappy, uncomfortable position. Dr. Gardner cautions us, and it pleases me, because it is a step in the right direction. We do not want to sacrifice the alveolar process of jaws of patients who must subsequently wear artificial dentures.

Reminiscences of Forty-five Years in Dentistry

By C. N. JOHNSON, M.A., L.D.S., D.D.S., M.D.S., F.A.C.D., Chicago, Illinois

VIII

G. V. Black

AS I look back over the very active years of my practice in Chicago and my association with so many of the men who have given form to the profession in that time, I am embarrassed by the wealth of material at hand, and confused as to the most orderly manner to approach it. And yet out of all the great men it has been my privilege to know, and of the many incidents and experiences which have enriched my professional life, there stands out in bold relief the figure of one man who as an intellectual giant in dentistry, and as a man versatile in other avenues of thought, towers commanding and colossal as the giant oak towers above the shrubbery of the garden hedge. Wherever scientific dentistry is known the name of Greene Vardiman Black is a household word, and I count it as a peculiarly fortunate circumstance of my professional life that I was privileged to know him so intimately for so many years.

The first time I saw him was as he entered the lecture-room of the Chicago College of Dental Surgery where I was taking a course for my D.D.S. degree before beginning practice in Chicago. He was then living in Jacksonville, Illinois, and came to Chicago to lecture in the College. I shall never forget his lectures. He always came prepared with written notes, and even sometimes wrote his lectures in full. Of course they were wonderfully well prepared, and contained the essentials of the subject as then understood. But what I enjoyed most was when he turned away from his manuscript to elucidate some point, and, becoming interested, forgot about his notes and gave free rein to his marvelous command of the subject. It was then that the very essence of the man came out, and manifested itself in such an exposition of scientific lore that the entire class was carried with him. I have never ceased to regret that Dr. Black ever wrote out his lectures for that course. And yet it was done, as he afterward informed me, with the conscientious idea that he could more coherently and consecutively follow the subject, and cover the essentials without waste of words.

From the time of my graduation in the spring of 1885 to the date of his coming to Chicago to live—a period of more than ten years—I was in quite frequent correspondence with him over various matters connected with the theory and practice of dentistry. Some of these letters shed illumination on certain phases of his character which were not generally known to the profession, and I wish I had space to reproduce them. I must at least permit myself the pleasure of using some extracts from a few of them, and one of them I purpose publishing in full.

They were mostly written during that epochal period when he was producing the wonderful series of articles on the physical characters of the teeth and of filling materials. He was also studying the matter of the stress of mastication, and its relation to cavity preparation and the resistance of fillings. His idea had been—as with most of the profession—that the stress of mastication was very much less than it really is, and it is interesting to trace his trend of thought as development after development opened up new light on the subject. His first gnathodynamometer was made to register 150 lbs., as the supposed extreme limit of power to be exerted by any human jaw. On February 2, 1895, he writes: "I gave it to Dr. Sawyer, who knows most of the working men about town, and told him to get tests of the strongest men he could find. Well, he brought back the names of thirteen who shut the thing up tight with their incisor teeth without any trouble. Dr. Sawyer did it himself easily enough not only once but played the thing up and down half a dozen times, simply opening and shutting his mouth. The blamed thing rather gets away with me. Anyhow I have taken the machine to a mechanic to have it reconstructed on the basis of 250 lbs., and shall cut the register myself and see to it that it is correct and no dodging. I think that will reach the gentlemen. By the way, one of these individuals is a butcher who amuses his friends by *catching up a quarter of beef with his teeth and walking off with it.*"

On March 11, he writes: "My reconstructed occlusometer—or gnathodynamometer (now how do you like that word?)—is all right, but only registers 175 lbs., and a lot of the fellows shut it up as easily as a jackknife. My assistant at the chair—a little dumpy girl of 120 lbs., closes down 160 lbs. almost as if it were a piece of cheese on molars in which I made large mesio-occlusal fillings five years ago. The blamed thing makes me shake in my boots. I am sure the instrument tells the truth. I have tested it thoroughly. I see no way but to make an instrument of a couple of steel crowbars to use for butchers and such."

But Dr. Black was to find later that a machine to register 250 lbs. would not stop some people, and I believe eventually one was made to register 400 lbs., and even this was closed by one individual. A very interesting phase of the study is revealed in a letter about this time in which he says:

"That pesky gnathodynamometer is opening up some new lines of thought, and making me stare, turn blind, etc., a good many times. You remember that in one of my letters to you I spoke particularly of three girls—sisters—for whom I made amalgam fillings that I was so proud of—margins remaining perfect, etc. Well these girls, seemingly stout and hearty, *can't bite worth a cent.* Sixty-five pounds on the molars was the best I could get from any of them. Then there is a young fellow for whom I have been unable to make amalgam fillings stand—indeed the case has been one of my special chagrins for a number of years. It has seemed almost impossible to make fillings of any kind stand. Well this fellow *shut the thing up*—175 lbs. on the molars, and took hold with his incisors—pulps dead and more than half gold—and I stopped him when the needle passed the hundred-pound mark. Now I have been puffed up like a toad over my success in this one case, and all collapsed by my failure in the other, having no idea of the reason for the difference. I think I know more about it now."

Then came his study of amalgam. Dr. E. K. Wedelstaedt, of St. Paul, had been in the habit for some time of going to Jacksonville to study Dr. Black's methods, and on returning from one of his visits he called to see me, and asked me to publish a request in the *Dental Review*, which I was then editing, for makers of alloys to send samples to Dr. Black for study. Shortly after this request came out I received a letter from him stating

that I had got him into a peck of trouble—that the alloys were pouring in on him in an avalanche. I replied with Mark Twain's classic remark that if I had done anything I was sorry for I was glad of it.

I look upon Dr. Black's contribution to the study of amalgam as one of the most fruitful efforts of his life so far as real benefit to the masses of the people was concerned, and yet what a heart-breaking time he had with the material when he first began its study. The letter I am about to reproduce in full came from him as an outburst just as he was nicely getting into the subject, and when some of the startling revelations connected with the behavior of the material first broke in upon him in full force. On May 10, 1895, he wrote as follows:

DEAR DR. JOHNSON:

I'll have to blow off or I'll bust. Of all the pure and unadulterated cussed things, this amalgam business is the cussedest of the cussed, and merits all the cusses concentrated and boiled down that ever a pope stuck into a Bull of excommunication.

I completed today a preliminary tabulation of results of experiment with known (to me) formulas, and sat down after dinner for a quiet study of it. QUIET—did I say? Thunder and Tom Walker—the cussedness of the cussed stuff sticks out at every line of it. We have been coaxed and shouted at about *gold alloys*, platinum alloys, gold and platinum alloys, and all manner of cussed stuff and nonsense, increasing with the years as the vine creeps over the oak. But what has become of the acorns? Gone—and the oak itself is about ready to give up the ghost.

I don't know how to express my amazement. Gold, platinum, aluminum, zinc, copper, and the whole business are cussed adulterations—yes, poisons, nothing more nor less. They simply take a decent amalgam by the throat, and wrench the life out of it—leave it nothing to stand on but cussed brag—bulldozing the whole profession and our whole people. Thunder and Mars, what stuff we have for amalgam. Great Scott, only think of it. 3 per cent of gold added to a straight silver-tin amalgam increases the *flow* from 3 per cent to 25 per cent, and does it every time no matter who makes it—and the other infernal adulterations are as bad on the average, while some are worse.

Now how will a baldheaded old chap look flying in the face of the whole world with the plain truth about the matter? Much like a diminutive cat attacking a big bull dog, I suppose.

Yours truly,

G. V. BLACK.

In a more sedate vein he remarks in another letter: "It is a serious matter for a single observer to face the world with new facts, however well verified by his own observation, when they oppose directly generally received notions." And it was Dr. Black's lot "to face the world with new facts," at many stages of his investigations.

I have been struck in going over his letters with the amount of fun he interjected in his correspondence. One illustration is typical. I had been invited to give a lecture or talk in a distant part of the country on a certain subject. I gave it on the appointed date, and thought no more of the matter. It turned out that somewhere in the audience without my knowledge there was a reporter for a dental magazine taking notes, and in due time out came the journal with what purported to be a reproduction of my address. It was the most awful thing I have ever read. The flight of imagination indulged in by that reporter would put a modern airship to shame. Not only this but in several particulars I was made to affirm certain things the exact opposite of what I had emphatically stated. I have frequently been misquoted, but never before nor since have I ever seen any bit of printing so wholly inaccurate as was this. And there it stared me in cold type, which leads me to remark parenthetically that type is the most unrelenting thing in this work-a-day world. I have seldom been so disturbed over the publication of any single document as I was over this. Usually I try to accept the mistakes that inevitably creep in to the printed page and let it go at that, but this time I was terribly chagrined. Finally I did what I was accustomed to doing when anything disturbed me—I wrote Dr. Black. This is his answer:

DEAR DR. JOHNSON:

I must confess, though it may be mean of me, that I had to laugh when I read your letter today. I have been there myself and think I know something of how you feel. But of course that fellow over there knew much more about how that address *ought* to be than you. You are no editor. True you edit a journal but then you never did know much about it. The modern editor is the very chap to know just how to put a fellow's paper in the proper shape. What do you know about which side up a picture ought to be? You are only a kind of jack-leg artist anyway. What ails you any how? Just pull your hair a few days, and you'll feel all right again. I do not get that journal any more. I used to get it but somehow got out of it. Of course I am very anxious to see how neatly he has done you up.

Yours truly,

G. V. BLACK.

I felt better after that. Dr. Black evidently knew my temperament so well that he took the most effective means of healing the hurt. I never even wrote the editor about the matter—what was the use? A correction of a thing like that never corrects anything.

One more letter and I must forego the further pleasure of quoting from his correspondence. I had read a paper in one of the western states and it, with the discussion, appeared in the *Western Dental Journal*. On June 5, 1897, he writes:

DEAR DR. JOHNSON:

The *Western Dental Journal* came today, and when I got thru at the chair I went for it, and have just now finished the paper and the discussion. I want to say *Good Boy*. You did nobly. If we can keep this kind of pounding going there will be more improvement in the next ten years than there has been in the last twenty. I thank you.

Yours truly,

G. V. BLACK.

I think my readers will admit that Dr. Black was a most fascinating correspondent. To his friends he let himself out unreservedly, as some of these extracts will show. But after all it was the personal contact with the man that counted most, and I must reserve another chapter for this phase of his character.

(*To be continued*)

THE JOURNAL
of the
AMERICAN DENTAL
ASSOCIATION

Entered as second-class matter, March 22, 1915, at the Post Office at Huntington, Indiana, under the Act of August 24, 1912. Published Monthly.

Editor and General Manager,
OTTO U. KING, D.D.S., F.A.C.D., 5 N. Wabash Ave., Chicago, Illinois.
Associate Editors,
THOMAS P. HINMAN, D.D.S., F.A.C.D., Atlanta, Ga.
HARVEY J. BURKHART, D.D.S., LL.D., F.A.C.D., Rochester, N. Y.
THOMAS B. HARTZELL, D.M.D., M.D., F.A.C.D., Minneapolis, Minn

All expressions of opinion and all statements of supposed facts are published on the authority of the writer over whose signature they appear and are not to be regarded as expressing the views of the American Dental Association, unless such statements or opinions have been adopted by vote of the Association.

MANUSCRIPTS: Manuscripts should be typewritten, double-spaced, and the original, not the carbon copy, submitted. We cannot promise to return unused manuscript and used manuscript is not returned. Requests for reprints should be made at the time of forwarding article. We reserve the right to accept or reject any manuscript for publication. Articles are accepted for publication on condition that they are contributed solely to this journal.

SUBSCRIPTION included in the annual membership dues.

SUBSCRIPTION, $2.00 a year, in advance, to non-members, living in all parts of the United States or its possessions. Canada, $3.00. Foreign countries, $3.00. Single copies, 25 cents.

ADVERTISEMENTS accepted only from reliable firms. Fraudulent and misleading advertisements barred.

IN CHANGES of ADDRESS both the old and new address must be given.

JOURNALS are not sent beyond the subscription period.

VOL. 9 AUGUST, 1922 NO. 8

Editorial Department

A NEW IDEA IN COMMUNITY DENTAL SERVICE

There has recently been inaugurated in the city of Chicago a plan whereby the teeth of children may be adequately cared for without taxing private philanthropy or relying on civic appropriations. The profession is familiar with the splendid Forsyth Dental Infirmary of Boston, and the Eastman Dental Dispensary of Rochester. Dentists in the vicinity of Chicago also know of the generous assistance given to school dentistry in this city by Mr. Julius Rosenwald. In other sec-

tions of the country civic bodies have been induced to support this work, and everywhere there has been an awakening as to the urgent need of constructive measures for the amelioration of conditions existing in the mouths of the children of the nation.

But today Chicago has a plan whereby the need is to be met in a very unique way. The funds, instead of coming from private individuals or from civic bodies, are to come from the community, and the money is to be raised in such a way that the community will never feel the burden, and as a matter of fact it will be entertained and benefited while it is furnishing the funds.

In 1921, Mayor William Hale Thompson, with the aid of such men as Dr. John Dill Robertson, then commissioner of health, organized what was called the Pageant of Progress—an exposition illustrative of the development of the various arts, sciences, and industries in Chicago, as an instructive and educational movement whereby the masses might be made familiar with the growth and present status of the different industrial activities in their midst. This Pageant was held during the summer of 1921, and turned out such a success not only in an educative way but also in its financial returns that a fund was created of approximately $150,000 after all expenses were paid.

It is now the purpose to make this Pageant an annual event, and to utilize the money so raised for the building and maintenance of a dental infirmary for the care of the needy children of Chicago. It will thus be seen that the philanthropic and utilitarian features of this plan fit in so perfectly that it promises to be the solution of what has always been a difficult problem.

Dr. Robertson has been made manager of the Pageant, having resigned as commissioner of health for this purpose, and under his active and fertile brain there can be no question of the continued success of the enterprise.

At the Los Angeles meeting of the National Dental Association, Mayor Thompson sent a communication, on invitation of the president and secretary of the association, outlining the plans for this great philanthrophy, and enthusiastically assured the association that ground would probably be broken for the building not later than October of the present year.

This seems one of the most concrete and far-reaching plans ever devised for meeting the urgent need presented by the large percentage of children who are today suffering from dental neglect, and it is a movement which, in the very nature of its character, must ultimately draw to it the hearty support of every dentist in the land and of every worthy citizen of Chicago.

INDEX OF PERIODICAL DENTAL LITERATURE

Every reader of periodical literature in the profession must be familiar by this time with the splendid work done by Dr. Arthur D. Black and his co-workers in bringing out the *Index of Periodical Dental Literature.* Two volumes have already gone forth embracing the five-year periods 1911-1915, and 1916-1920. The widespread commendation of these volumes by the profession has encouraged Dr. Black to continue the work and the immediate result is a volume just issued covering the year 1921. It is the purpose to bring out a paper-covered volume each year till 1925, when the five volumes will be gathered into one, after such rearrangement as is necessary, and bound uniformly with the previous five-year volumes, thus completing the work from 1911 to date. Not only this but the editor is actively engaged in making a record of our literature from 1839 to 1880, or as near the latter date as may be included in one volume. When this is done, Dr. Black must not imagine that the profession will permit him to rest content till the gap between 1880 and 1911 is completely filled. At the consummation of this colossal achievement the profession of dentistry will have something to point to which will go farther than any other single accomplishment to give it status as a truly learned profession. This index is the one thing needed to establish the fact beyond cavil that dentistry is after all exceedingly rich in its literature, and that we as a profession need not hang our heads in shame when our record in this field is compared with that of other callings.

The immense amount of labor involved in getting out this index can be conceived only by those who have had practical experience with such work. To give to the average reader some idea, it is only necessary to state that in compiling the 1921 volume no fewer than fifty-eight separate dental journals, most of which issue monthly, had to be examined. The farther one looks into this task the greater it seems, and the profession will never be able to fully compensate Dr. Black, either in money or gratitude, for the service he has performed in connection with this work.

It is doing more to bring American dental activities before the world than anything that has happened in decades, as an illustration of which we may refer to the fact that one of the most appreciative notices that has appeared in connection with the work comes from the pen of Dr. Percy A. Ash, editor of *The Dental Science Journal of Australia,* in the May, 1922, issue of that publication. The index is placing dentistry on the map of the world, and giving form and stability to our literature. It is being issued under the direction of the American In-

stitute of Dental Teachers, and under the auspices of all the leading dental associations of the United States, Canada, Great Britain, New Zealand, and Australia.

Full particulars of this work may be obtained by writing the Secretary of the American Institute of Dental Teachers, Dr. Abram Hoffman, 381 Linwood Avenue, Buffalo, New York.

CHANGE OF NAME

Association Headquarters, Los Angeles, Cal., July 20, 1922.

This is just a brief announcement of the fact that at the 1922 meeting of the association the name was changed from the National Dental Association to the American Dental Association, under which destination the association will function in the future. Details of this and other important matters connected with the 1922 meeting will be given in our September issue. The 65th annual session will be held in Cleveland, Ohio.

NO, THE PUBLIC IS NOT AN ASS!

An eminent but somewhat irascible statesman, on being informed that the public had rejected a measure in which he was interested, remarked bluntly: "The public is an ass." Physicians who have viewed with astonishment, if not with dismay, the apparent popularity and financial advancement of ignorant mechanics, clerks and even ne'er-do-wells who have entered the healing art by the chiropractic route, have been inclined to approve the veracity of this caustic dictum. But recent developments seem to indicate that after all, that kindly, trusting, quizzical, little gentleman, Mr. Common Peepul, is beginning to see the light and to distrust appearances. The series of articles in *Leslie's Weekly*, previously mentioned in the *Journal*, revealed some of the obvious fallacies and a few of the rather secret commercial methods of the exponents of this push and shove school of healing; more recently *Collier's* through Uncle Jim Henry, than whom no better exponent of the common people exists, expressed some querulous doubts as to whether all was right in the land of chiropractic; and now the *Scientific American* (this issue, page 1338) sums up the situation in a simple logical statement. The public, honorable Sir, is not an ass, because an ass never learns. The public is awakening. The little toy balloons of the medical cults go sailing upward, but when they reach the rarefied atmosphere of scientific inquiry they explode with a mild pop and sink into oblivion.—*Jour. Amer. Med. Assoc.*, April, 1922.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Public Health Association, October 16-19, Cleveland, Ohio.

STATE SOCIETIES

August

Washington, at Seattle (2-5).

September

Delaware, at Wilmington (14).

October

Northern Illinois, at Rockford (18-19).
Northern Indiana, at Wabash (2, 3).
Virginia, at Richmond (18-21).
Susquehanna Dental Association of Pa., at Scranton (25, 26, 27).

March (1923)

Michigan, at Detroit (27, 28, 29, 30, 31).

May

New York, New York City (9, 10, 11, 12).
Pennsylvania, Philadelphia (8, 9, 10).

NEW YORK STATE DENTAL SOCIETY

The annual meeting of the New York State Dental Society will be held in the Commodore Hotel, New York City, May 9, 10, 11, 12, 1923.

WALTER E. FANCHER, *Chairman,*
377 S. Broadway, Yonkers, N. Y.

VIRGINIA STATE DENTAL ASSOCIATION

The fifty-third annual meeting of the Virginia State Dental Association will be held in Richmond, October 18 to 21, 1922. The headquarters will be at the Hotel Jefferson.

HARRY BEAR, *Secretary,*
410 Professional Bldg., Richmond, Va.

CHICAGO DENTAL SOCIETY

The annual midwinter clinic of the Chicago Dental Society will be held at the Drake Hotel, January 18, 19 and 20, 1923.

All members of the American Dental Association are invited to attend. Ethical non-member practitioners, making application for membership at this meeting, will be admitted. Hotel reservations should be made direct with the hotel management.

For further information please communicate with

M. M. PRINTZ, *Secretary*
25 E. Washington St., Chicago.

NORTHERN ILLINOIS DENTAL SOCIETY

The thirty-fifth annual meeting of the Northern Illinois Dental Society will be held at Rockford, Illinois, October 18 and 19, 1922.

B. H. BIGLOW, *Secretary,*
Rockford, Ill.

SUSQUEHANNA DENTAL ASSOCIATION OF PENNSYLVANIA

The fifty-ninth annual meeting of the Susquehanna Dental Association of Pennsylvania will be held at the Hotel Casey, Scranton, Pa., October 25, 26 and 27, 1922.

GEORGE C. KNOX,
Recording-Secretary,
Middletown, N. Y.
D. S. GARDNER,
Chairman of Executive Committee,
Scranton, Pa.

MICHIGAN STATE DENTAL SOCIETY

The Michigan State Dental Society will hold its annual convention March 27-31, 1923 at Detroit. For information write

BION R. EAST,
Chairman Local Arrangements Committee,
504 Fine Arts Bldg., Detroit, Mich.

DENTAL CORPS ORDERS FROM WAR DEPARTMENT

Army

Captain Edwin St. C. Wren, from duty at Fort Howard, Md., to Army Medical School for duty.

First Lieutenant Charles E. Callery, honorably discharged with one year's pay.—*Army and Navy Register,* July 1, 1922.

Army Dental School Graduates

Honor Men—Captains Glenn D. Lacey, Clarence C. Olson and Arne Sorum.

Graduates—Captain Egbert W. Cowan, Frank A. Crane, Robert C. Craven, Herbert E. Guthrie, Ralph O. Leonard, John S. Ross, Melville A. Sanderson, William E. Sankey, Henry A. Winslow; First Lieutenants John C. Burr and Rufus W. Leigh.

Navy

The following promotions in the Navy have been announced:

John R. Barber to be dental surgeon.

Andrew L. Burleigh and Robert H. Fladeland to be passed assistant dental surgeons.

Army Medical Department Elimination

In the Army Dental Corps the loss by reason of elimination, under the new legislation will be 77 officers, which, if distributed as to grades, would mean the elimination of from 2 to 3 colonels, 5 to 7 lieutenant colonels, 20 to 22 majors, and the remainder among the captains and lieutenants. This means a sacrifice of 32, 7 per cent in personnel and will require the discharge or retirement of officers of experience, with fine war service to their credit, many of whom, as in the class just graduated in Washington, especially educated at great expense for the military establishment. Their places will be difficult to fill, to say nothing of the discouragement that is given to those who contemplate entering the dental corps hereafter. While the younger men will have, perhaps, little difficulty in establishing themselves with a year's pay in their possession the older members of the profession may find it not so easy. Most of them, too, will not be able to count for retirement service that is now counted for promotion, longevity pay, and retirement, authorized by no less than five laws and a comptroller's decision. The statutes are those of March 3, 1911; June 3, 1916; October 6, 1917; June 4, 1920, and May 10, 1922. The comptroller's decision is that of July 22, 1916. As in other branches of the medical department, demotion is not possible for the dental officers except such as is furnished by conversion into warrant officer or retirement as such, which is equivalent to retirement with the pay of a first sergeant—and this for officers who have served as dental surgeons from 17 to 22 years, a period that, under the new legislation, is thrown into the discard for the purposes of retirement in the elimination process.—*Army and Navy Register,* July 1, 1922.